5-4310-354-14

TM 5-4310-354-14

TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

COMPRESSOR, ROTARY; AIR, SKID MOUNTED; DIESEL ENGINE DRIVEN, 125 CFM, 100 PSIG
(DAVEY MODEL 6M125)
NSN 4310-01-043-7604

This copy is a reprint which includes current pages from Change 1.

HEADQUARTERS, DEPARTMENT OF THE ARMY
25 APRIL 1980

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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 27 March 1987

Operator's, Organizational, Direct Support and General Support Maintenance Manual

COMPRESSOR, ROTARY; AIR, SKID MOUNTED; DIESEL ENGINE DRIVEN, 125 CFM, 100 PSIG
(DAVEY MODEL 6M125)
NSN 4310-01-043-7604

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3-7 through 3-10	3-7 through 3-10
---	3-10.1/3-10.2
4-3 and 4-4	4-3 and 4-4
4-5 and 4-6	4-6

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

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To be distributed in accordance with DA Form 12-25A, Operator's, Organizational, Direct Support and General Support Maintenance requirements for Compressor, Rotary, Air, Diesel Engine, Skid Mounted, 125 CFM, 100 PSI (6M125).

WARNING

DEATH

or severe injury to personnel or damage to property may result if personnel fail to observe safety precautions.

Do not operate air compressor unit in an enclosed or sheltered area unless the exhaust gases are piped outside.

Ear protection required within 26 feet (7.92 meters) while unit is operating.

The unit lifting device used must be capable of lifting a minimum of 2 tons (1.82 metric tons).

To prevent serious burns when filling battery, take precautions against spilling electrolyte on clothing or allowing it to come in contact with skin or eyes. Use rubber gloves.

Do not remove oil filler plug with air pressure in the oil separator tank.

Provide adequate ventilation when using Methyl Ethyl Ketone (MEK). Avoid prolonged breathing of vapors and minimize skin contact.

Dry cleaning solvent P-D-680, used to clean parts, is potentially dangerous. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-138°F (38°C-59°C).

Do not puncture or mishandle the quick start fuel cylinder. The fuel cylinder contains an ether base mixture that is extremely toxic, volatile, and combustible. Do not operate quick start at temperatures above 40°F (4.4°C).

Disconnect battery terminals before removing electrical cables, leads, and components.

TECHNICAL MANUAL

No. 5-4310-354-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 25 April 1980

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

COMPRESSOR, ROTARY; AIR, SKID MOUNTED; DIESEL ENGINE DRIVEN, 125 CFM, 100 PSIG
(DAVEY MODEL 6M125)
NSN 4310-01-043-7604

REPORTING OF ERRORS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Troop Support & Aviation Materiel Readiness Command, ATTN: DRSTS-MTP, 4300 Goodfellow Boulevard, St. Louis, MO 63120. A reply will be furnished to you.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope. This manual is for your use in operating and maintaining the skid mounted, diesel engine driven, rotary air compressor, model 6M125.

1-2. Maintenance Forms and Records. Maintenance forms and records that you are required to use are explained in TM 38-750.

1-3. Hand Receipt. Hand receipt for the End Item/ Component of End Item (COEI), Basic Issue Items (BII) and Additional Authorization List (AAL) Items are published in a Hand Receipt Manual. The Hand Receipt Manual numerical designation is the same as the related Technical Manual with the letters HR added to the number. These manuals are published to aid in property accountability and are available through: Commander, U.S. Army Adjutant General Publication Center, ATTN: AGDL-OD, 1655 Woodson Road, St. Louis, MO 63114.

1-4. Equipment Serviceability Criteria (ESC). This equipment is not covered by an ESC.

1-5. Destruction of Army Materiel to Prevent Enemy Use. For instructions covering the destruction of Army materiel to prevent enemy use, refer to TM 750-224-3.

1-6. Administrative Storage. Refer to TM 740-90-1 for administrative storage.

1-7. Calibration. There is no calibration required for this equipment.

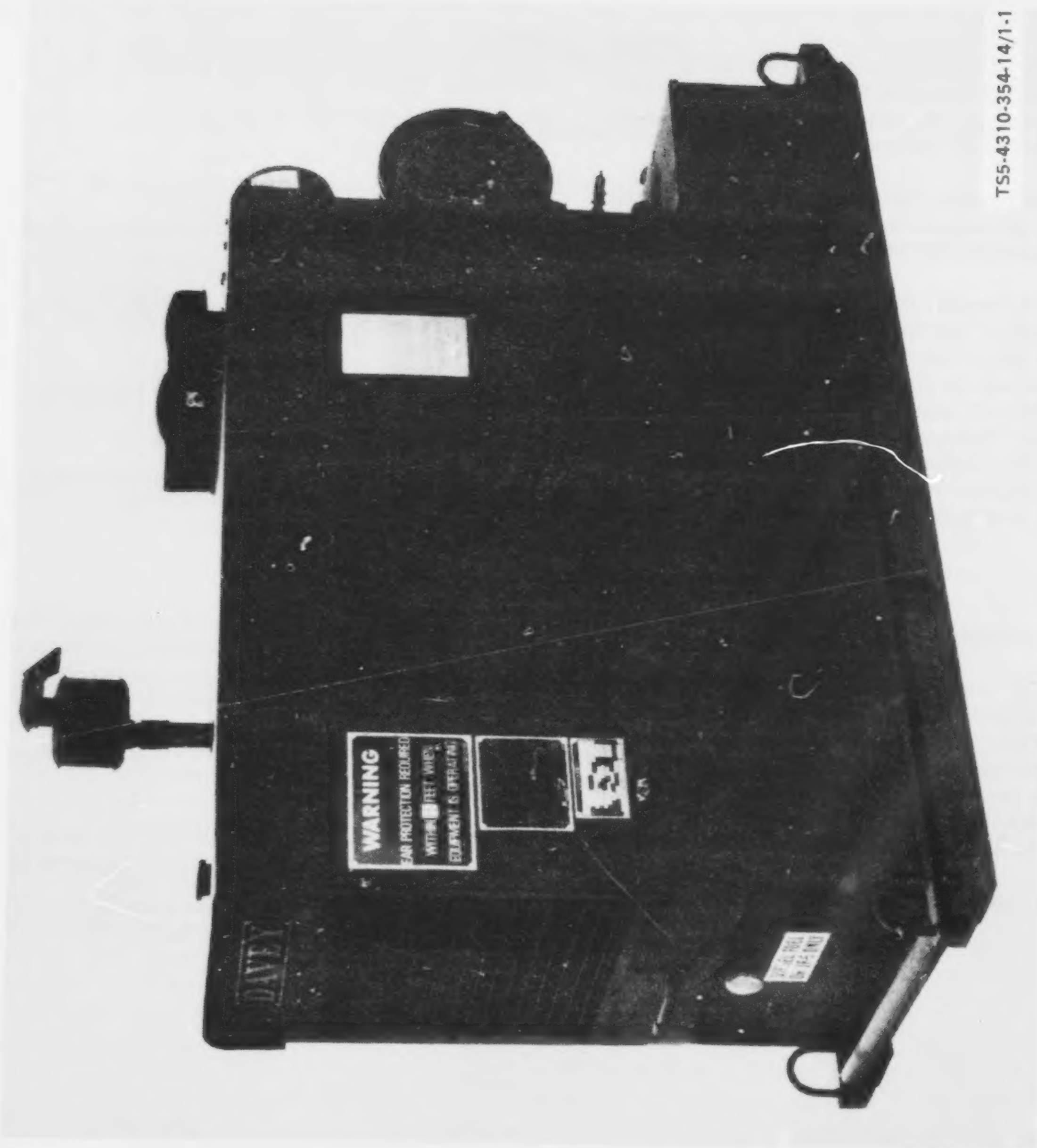
Section II. DESCRIPTION AND DATA

1-8. Description.

a. The air compressor unit is a skid mounted, diesel engine driven, sliding blade type, rotary air compressor. The unit supplies compressed air at the rate of 125 cubic feet per minute (CFM) (3.5 M^3/MIN) at a discharge pressure of 100 pounds per square inch (PSI) (7 KG/CM^2). You will find identifying views of the unit in figures 1-1 and 1-2.

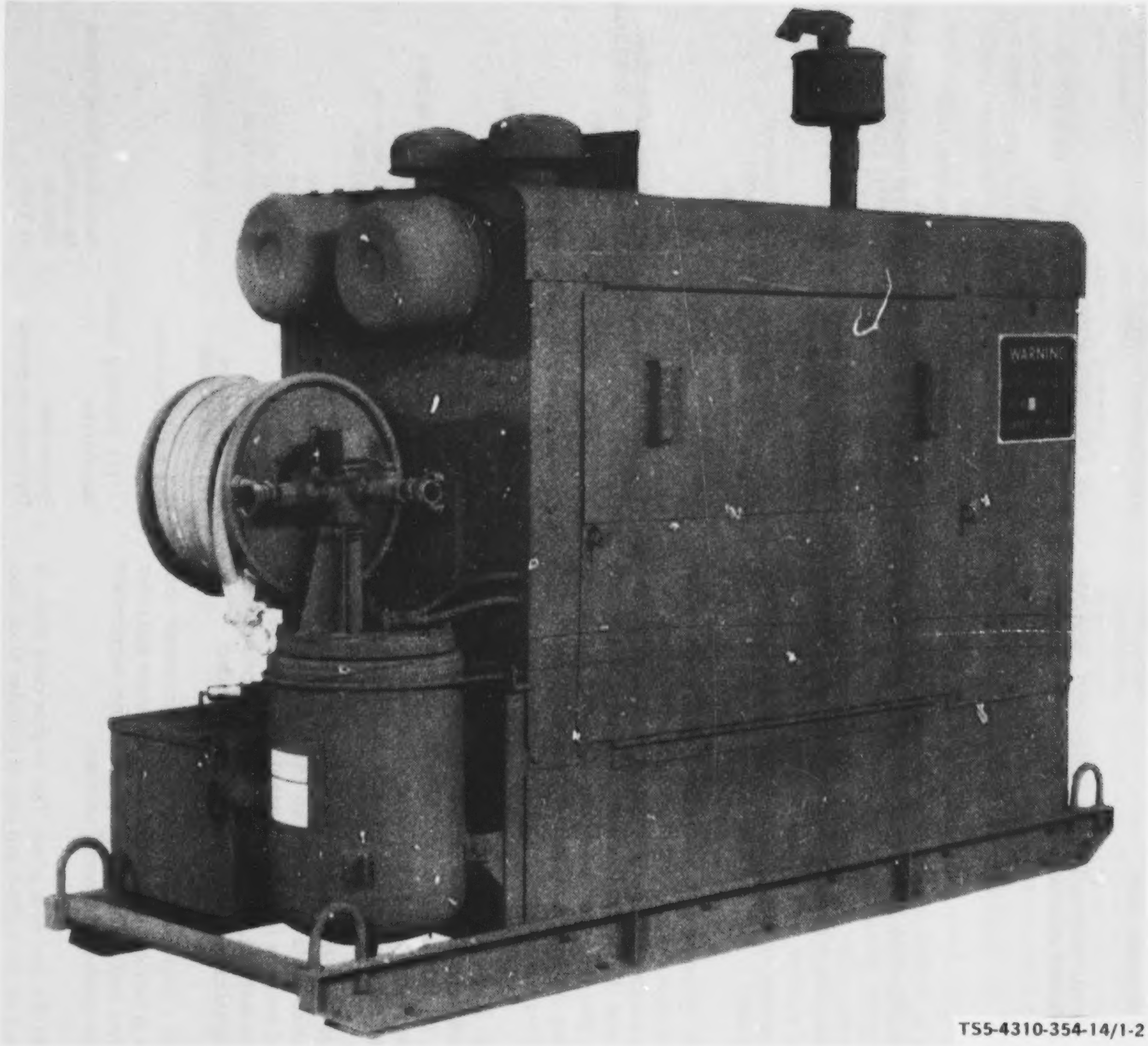
b. The compressor unit is enclosed in a sheet metal housing fastened to a welded steel skid frame. The unit is self-contained and capable of continuous operation, under normal conditions, for a period of eight hours without refueling. The unit is designed to supply compressed air for general construction work in conjunction with pneumatic tools and other equipment.

c. The maintenance paragraphs of this manual contain detailed descriptions of the unit components.


WARNING
EAR PROTECTION REQUIRED
WITHIN FEET WHEN
EQUIPMENT IS OPERATING
DAVEY

TS5-4310-354-14/1-1

Figure 1-1. Model 6M125 rotary air compressor skid, left front, three-quarter view.



TS5-4310-354-14/1-2

Figure 1-2. Model 6M125 rotary air compressor, right rear, three-quarter view.

1-9. Difference Between Models. This manual covers only the Davey Compressor Company Model 6M125 rotary air compressor. No known differences exist for the model covered herein.

1-10. Tabulated Data.

a. Identification. The air compressor unit has major identification and instruction plates. The location and informational content of these plates is as follows:

(1) *U.S. Army data plate.* The U.S. Army data plate is located on the left front housing support panel. The data plate specifies the unit nomenclature, model number, contract number, serial number, capacity, registration number, gross vehicle weight, National Stock Number, date of manufacture, engine serial number, unit weight, warranty data, physical dimensions, date shipped, inspection data, and manufacturer.

(2) *Shipping data plate.* The shipping data plate is located on the left front housing support panel. This plate shows a silhouette of the unit in transport position and illustrates location of lifting and tiedown eyes. The plate specifies center of gravity, maximum loading of lifting and tiedown eyes, dimensions, and shipping weight.

(3) *Hazard warning plate.* You will find two hazard warning plates, located one on each side of the unit, mounted on the front housing support panels. These plates specify the distance within which ear protection is required when unit is operating.

(4) *Operating instruction plate.* The operating instruction plate is located on the left housing door panel near the instrument panel. The plate specifies before starting, starting, and stopping instructions. Lubrication specifications are also included.

(5) *Compressor data plate.* The compressor data plate is located on the top of the compressor end cover (driven end). The plate specifies the compressor model number and serial number.

(6) *Engine data plate.* The engine data plate is located on the right-hand side of cylinder block (facing flywheel). The plate specifies cylinder firing order, exhaust and inlet valve tappet clearance settings, engine timing in degrees before top dead center (BTDC), serial and model number.

(7) *Fuel injection pump plate.* This plate is located on the side of the fuel injection pump housing. Plate data includes injection pump model number, full load speed in rpm, serial number, engine manufacturer's part number assigned to the pump, and the pump manufacturer's name.

b. Tabulated Data.

Compressor Skid Unit Assembly

Manufacturer	Davey Compressor Company
Model number	6M125
Air compressor type	Sliding blade, rotary
Unit part number	68516
Air volume	125 CFM (3.5M^3/MIN)
Air pressure	100 PSI (7 KG/CM^2)
Stages	One
Prime mover	Diesel engine
Compressor oil filter part number	44686 (Assembly) 27268 (Element)
Air cleaner assembly	MS39247-3
Air cleaner element	P10-6603
Electrical system (negative ground)	12 VDC
Mounting	Skid
Serial numbers	32P65-23398, 32P65-23399, 32P65-23561 thru 32P65-23520
National Stock Number (NSN)	4310-01-043-7604

Engine Assembly (prime mover)

Manufacturer	White Engines, Inc.
Model	D2000X116
Type	4-Cycle Diesel
Number of cylinders	4
Bore and stroke	3¾ x 4½ inches (9.525 x 11.43 CM)
Displacement	198.81 Cubic inches (3258.50 CM^3)
Firing order	1-2-4-3
Governed speed	2200 rpm
Idle speed	1000 rpm
Horsepower	59.3 BHP (60.130)
(Net continuous)	38.6 BHP (39.14)
Recommended fuel (Fed Spec VV-F-800)	No. 2 (ASTM D-975)

Engine Accessories

(1) *Starting motor*

Manufacturer	Delco-Remy Div of General Motors Corp
Part number	1109189
Type (negative ground)	12 VDC

(2) *Alternator*

Manufacturer	Delco-Remy Div of General Motors Corp
Part number	1100582
Rating (negative ground)	12 VDC, 37 AMP

(3) *Fuel injection pump*

Manufacturer (Roosa Master)	Stanadyne/Hartford
Part Number	DBGFC433-22AL

(4) *Fuel filter*

Manufacturer	White Engines, Inc.
Part number	40-0002514
Type	Spin-On, Throw-away

(5) *Oil filter*

Manufacturer	White Engines, Inc.
Part number	40-0000401
Type	Spin-On, Throw-away

Capacities

Fuel tank	19 Gallons (71.9 liters)
Engine lubrication system (with 1 quart for filter)	7 Quarts (6.6 liters)
Compressor lubrication system	4 Gallons (15.14 liters)
Engine cooling system	4 Gallons (15.14 liters)

Overall dimensions and weight.

Overall length	80 Inches (203.2 CM)
Overall width	29 Inches (73.7 CM)
Overall height	61 Inches (154.9 CM)
Volume	82 Cubic Feet (2.32 M^3)
Weight	2100 Pounds (952.56 KG)

c. *Wiring Diagram.* Refer to figure 1-3.

d. *Torque Data.* Torque data applicable to the air compressor unit assembly, including standard and specific torque limits, recommended by the manufacturer are found in table 1-1.

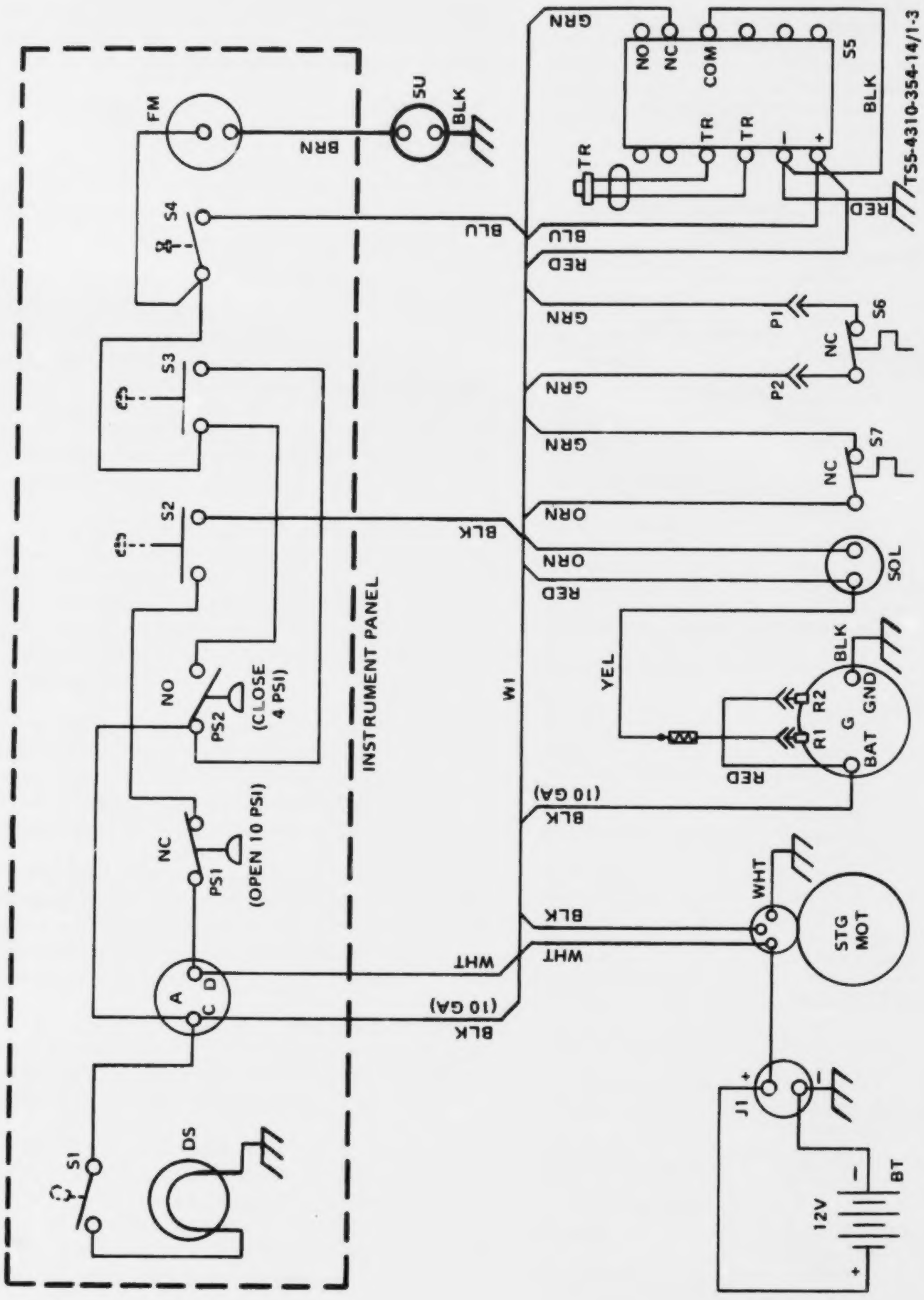

INSTRUMENT PANEL
FM
SU
BLK
BRN
S4
S3
S2
S1
DS
NO
PS2
(CLOSE 4 PSI)
NC
PS1
(OPEN 10 PSI)
A
C
D
BLK
(10 GA)
WHT
W1
BLU
RED
GRN
ORN
YEL
BLK
(10 GA)
BLK
WHT
R1
R2
G
BAT
GND
SOL
TR
NO
NC
COM
TR
TR
-
+
S5
BLK
RED
P1
P2
NC
S6
NC
S7
STG MOT
WHT
J1
+
-
12V
BT
TS5-4310-354-14/1-3

Figure 1-3. Schematic wiring diagram.

KEY to figure 1-3:

A — Ammeter
BLK — Black wire
BLU — Blue wire
BRN — Brown wire
BT — Battery
COM — Common
DS — Instrument panel lamp
FM — Fuel level gauge
G — Alternator
GRN — Green Wire
J1 — Battery charging receptacle
NC — Normally closed
NO — Normally open
ORN — Orange wire
PSI — Pounds per square inch
PS1 — Air pressure switch
PS2 — Oil pressure switch
P11 — Plug, connector
P2 — Plug, connector
RED — Red wire
S1 — Lamp switch, toggle
S2 — Start switch, pushbutton
S3 — Safety override switch, pushbutton
S4 — Ignition on-off switch, pull-push
S5 — Engine overspeed switch
S6 — Oil temperature switch
S7 — Water temperature switch
SOL — Solenoid, fuel injection pump
SU — Fuel level sending unit
STG MOT — Starting motor
TR — Transmitter, overspeed
WHT — White wire
W1 — Wiring harness
YEL — Yellow wire

Table 1-1. Torque Data

COMPRESSOR — Specific Torque Limits

Application	Cap Screw Size	Foot-pounds	Kilograms-meters
Bearing covers, each end (6)	5/16-18NC x 1-1/4	11	1.52
Intake control cover (6)	5/16-18NC x 1-1/2	11	1.52
Non-drive end cover (5)	1/2-13NC x 1-1/4	45	6.22
Non-drive end cover (1)	1/2-13NC x 2-3/4	45	6.22
Drive end cover (6)	1/2-13NC x 2-1/2	45	6.22
Drive coupling retainer, special (1)	1/2-13NC x 1-1/2	45	6.22

COMPRESSOR — Standard Torque Limits

Size	Foot-pounds	Kilograms-meters	Size	Foot-pounds	Kilograms-meters
1/4-20NC	7-9	0.97-1.24	9/16-12NC	90-100	12.45-13.83
1/4-28NF	8-10	1.11-1.38	9/16-28NF	107-117	14.80-16.18
5/16-18NC	13-17	1.80-2.35	5/8-11NC	137-147	18.95-20.33
5/16-24NF	15-19	2.07-2.63	5/8-18NF	168-178	23.23-24.62
3/8-16NC	30-35	4.15-4.84	3/4-10NC	240-250	33.19-34.58
3/8-24NF	35-39	4.84-5.39	3/4-16NF	290-300	40.02-41.49
7/16-14NC	46-50	6.36-6.92	7/8-9NC	410-420	56.70-58.09
7/16-20NF	57-61	7.88-8.44	7/8-14NF	475-485	65.69-67.08
1/2-13NC	71-75	9.82-10.37	1-8NC	580-590	80.21-81.60
1/2-20NF	83-93	11.48-12.86	1-14NF	685-695	94.74-96.12

Table 1-1. Torque Data — Continued

ENGINE — Specific Torque Limits

Application	Foot-pounds	Kilograms-meters
Main bearing cap screws:		
Front	130	17.98
Intermediate	130	17.98
Center	100	13.83
Rear	130	17.98
Connecting rod bolts	70	9.68
Camshaft gear nut	130	17.98
Crankshaft pulley	125	17.29
Flywheel-to-crankshaft bolts	80	11.06
Flywheel housing-to-block bolts	40	5.53
Oil pump attaching bolts	25	3.46
Cylinder head nuts:		
9/16-inch studs	160	22.13
5/8-inch studs	175	24.20
Exhaust manifold nuts	20	2.77
Intake manifold nuts	20	2.77
Fuel pump attaching nuts	15	2.07
Injector nozzle flange bolts	20	2.77
Fuel lines	20	2.77
Idler gear cap screw (use Loctite)	25	3.46
Fuel injection pump drive gear nut	65	8.99
Water pump attaching bolts	24	3.32
Oil pan attaching bolts	15	2.07
Gear housing attaching bolts	40	5.53
Gear cover attaching bolts	15	2.07
Thermostat housing bolts	15	2.07
Cam thrust plate bolts	9	1.25
Oil pan adapter-to-housing bolts	15	2.07
Tappet adjusting screw	3-10	0.42-1.38

FUEL INJECTION PUMP — Specific Torque Limits

Application	Foot-pounds	Kilograms-meters
Fuel line connection screws	35	4.84
Delivery valve screw	7-7.5	0.97-1.04
End plate sleeve	20	2.8
Cam advance screw	33	4.6
Head locating screw	37	5.1
Head locking screws	30	4.1
Pivot shaft nuts	1.7-2.1	0.24-0.29
Torque screw	2	0.28
Guide stud	9.2-9.6	1.27-1.33
Automatic advance plugs	23	3.2
Throttle lever spacer positioning screw	2.1-2.5	0.29-0.35
Throttle lever retaining screw	2.5-3.3	0.35-0.46
Cover screws	3.3	0.46

CHAPTER 2

OPERATING INSTRUCTIONS

WARNING

If equipment fails to operate, refer to troubleshooting procedures in chapter 3.

Section I. OPERATING PROCEDURES

2-1. General.

a. Inspecting and Servicing. The air compressor unit is shipped by the manufacturer as a completely assembled skid mounted unit. Lifting provisions are provided on the skid as shown in figure 2-1.

NOTE

The method of attachment of the air compressor skid to the transporting equipment will be determined by the type of carrier used.

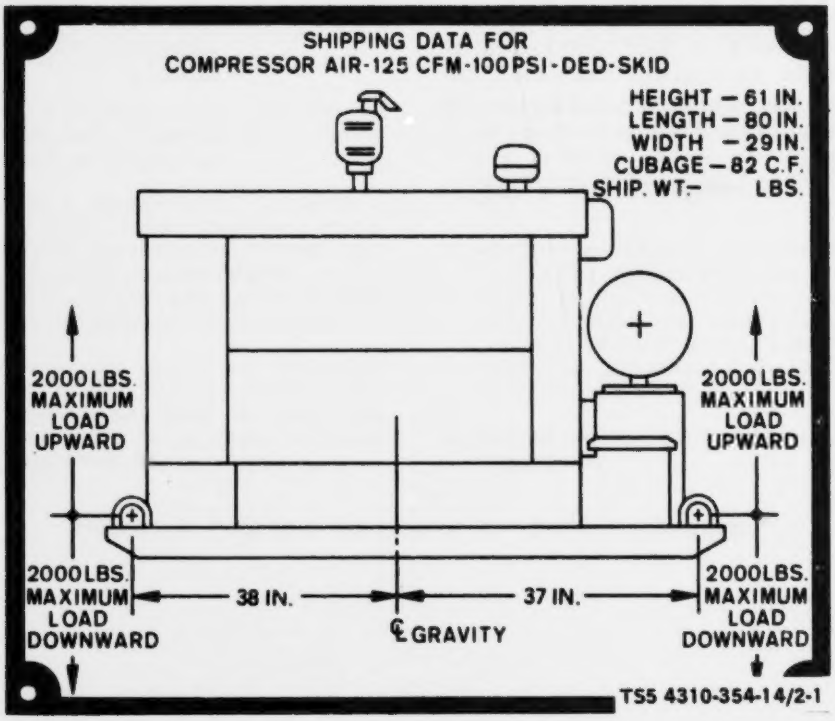

SHIPPING DATA FOR
COMPRESSOR AIR-125 CFM-100PSI-DED-SKID
HEIGHT — 61 IN.
LENGTH — 80 IN.
WIDTH — 29 IN.
CUBAGE — 82 C.F.
SHIP. WT.— LBS.
2000 LBS. MAXIMUM LOAD UPWARD
2000 LBS. MAXIMUM LOAD UPWARD
2000 LBS. MAXIMUM LOAD DOWNWARD
38 IN.
37 IN.
℄ GRAVITY
2000 LBS. MAXIMUM LOAD DOWNWARD
TS5 4310-354-14/2-1

Figure 2-1. Shipping data plate.

(1) *Unloading.* The air compressor unit can be unloaded from the transporting carrier by a lifting device or pulled on its skid frame. When lifting device is used, attach the device as shown in figure 2-1.

WARNING

The unit lifting device must be capable of lifting a minimum of 2 tons.

(*a*) Remove all blocks and tie downs that secure the air compressor skid unit to the carrier.

(*b*) Lift or pull the unit off the carrier.

(2) *Unpacking and deprocessing.* Remove all crating, blocking, and protective material.

(*a*) Remove separately packed components from the air compressor unit.

(*b*) Carefully unpack components and inspect for damage. Refer to paragraph 2-1.*b* for instructions on installing separately packed components.

(*c*) Refer to DA Form 2258 (Depreservation Guide for Vehicles and Equipment) furnished with the unit and complete the deprocessing before any servicing is attempted.

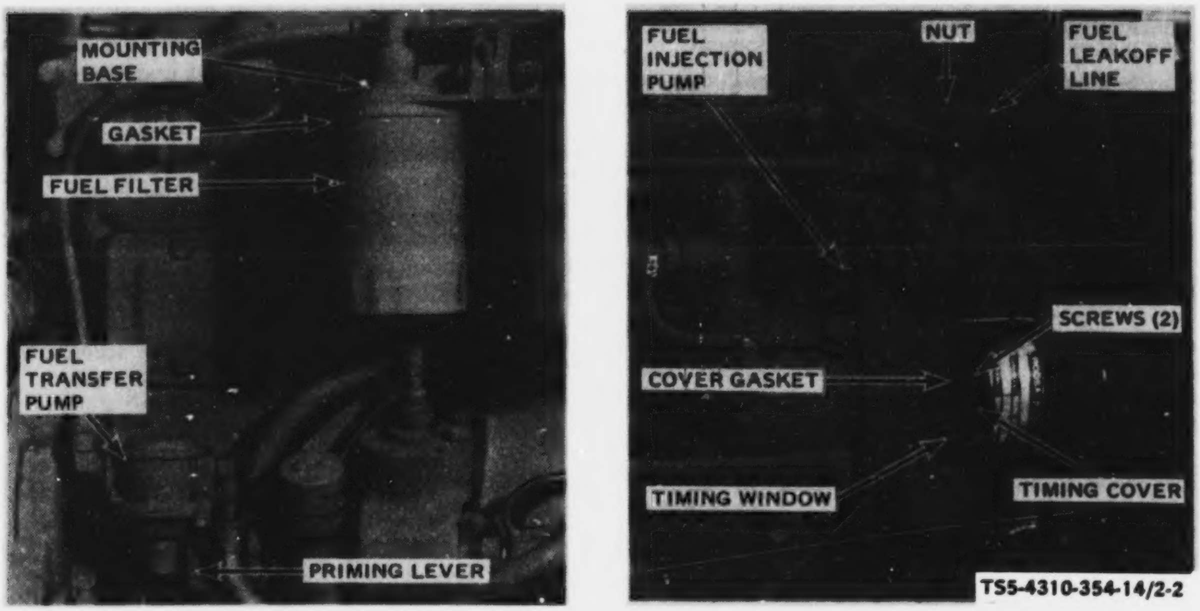
(*d*) New equipment that has not been p into service and/or equipment stored fo period of time exceeding 90 days witho starting must have engine fuel injectic pumps completely purged with clean fu before any attempt is made to crank th engine. If procedures below are not fo lowed, fuel pump seizure could occur.

CAUTION

Engines should not be started the first time using the fuel pump as the sole primer for the fuel. The system should be purged so as to have a full flow of fuel at the injection pump. Under no circumstances should the engine be motored with the starter or by other means until fuel system is completely emptied of preserving oil and properly primed with prescribed grade of diesel fuel.

1. Remove drain plug from bottom of fuel tank and drain any fuel or condensate that may be present in the tank. Install the drain plug and fill the fuel tank with clean diesel fuel. Refer to paragraph 1-10.*b*. for grade of fuel and capacity.

2. Purge the fuel injection pump of preserving oil as shown in figure 2-2.


MOUNTING BASE
GASKET
FUEL FILTER
FUEL TRANSFER PUMP
PRIMING LEVER
FUEL INJECTION PUMP
NUT
FUEL LEAKOFF LINE
SCREWS (2)
COVER GASKET
TIMING WINDOW
TIMING COVER
TS5-4310-354-14/2-2

A FUEL FILTER AND FUEL TRANSFER PUMP

B FUEL INJECTION PUMP

1. UNSCREW FUEL FILTER BY TURNING COUNTERCLOCKWISE USING A STRAP TYPE WRENCH OR EQUIVALENT. REMOVE THE FILTER AND POUR OFF PRESERVING OIL. FLUSH THE FILTER THOROUGHLY IN CLEAN DIESEL FUEL OR REPLACE.

2. REINSTALL FUEL FILTER MAKING SURE GASKET IS NOT DAMAGED AND IS SEATED PROPERLY IN MOUNTING BASE.

3. PLACE A SUITABLE RECEPTACLE, SUCH AS A BUCKET OR THE LIKE, UNDER THE FUEL INJECTION PUMP. REMOVE TWO SCREWS, TIMING COVER, AND COVER GASKET. ALLOW PRESERVATIVE TO DRAIN FROM THE PUMP. LEAVE THE TIMING COVER OFF UNTIL SYSTEM IS FULLY PRIMED.

4. ACTIVATE THE PRIMING LEVER ON THE FUEL TRANSFER PUMP UNTIL CLEAN DIESEL FUEL FLOWS FROM TIMING OPENING ON INJECTION PUMP. THE DIESEL FUEL IS LIGHTER IN COLOR AND THINNER THAN THE PRESERVING OIL.

5. REASSEMBLE TIMING COVER GASKET, TIMING COVER, AND ATTACH WITH TWO SCREWS. THE SCREWS NEED ONLY TO BE TIGHTENED SNUGLY SINCE THE GASKET IS SYNTHETIC RUBBER. DO NOT OVERTIGHTEN.

6. LOOSEN FUEL LEAKOFF LINE NUT AT THE TOP OF THE INJECTION PUMP. CONTINUE TO ACTUATE THE PRIMING LEVER UNTIL PRESSURE PUMPS HARD AND DIESEL FUEL FLOWS FROM LOOSENED NUT.

7. MOTOR THE ENGINE WITH THE STARTER USING THE START PUSHBUTTON ON THE INSTRUMENT PANEL (9, FIG 2-3) WITH IGNITION SWITCH (11) OFF AND IDLE (13) CONTROL HANDLE IN AND LOCKED. MOTOR UNTIL DIESEL FUEL FLOWS FROM THE LOOSENED FUEL LEAKOFF LINE NUT; THEN, TIGHTEN NUT.

8. ENGINE IS NOW READY FOR NORMAL STARTING PROCEDURE.

Figure 2-2. Purging preserving oil from fuel injection pump.

(3) *Inspecting the equipment*. Check identification plates for identification of the equipment.

(*a*) Check equipment against packing list.

(*b*) Inspect for, and tighten, any loose nuts, bolts, and screws.

(*c*) Inspect all controls, instruments, and gauges for damage or loose mounting.

(*d*) Check all accessories for damage and loose or missing hardware.

(*e*) Inspect electrical wiring for frayed insulation or other damage. Refer to wiring diagram, figure 1-3.

(*f*) Check condition of fan drive belt and belt tension (figure 3-9). Ensure that fan i securely mounted and that there is clea ance between fan blades and fan guard

(*g*) Inspect all piping, air tubing, and hos assemblies for loose connections an damage.

(4) *Servicing equipment*. Perform all daily an before operation preventive maintenance checks an services (table 3-1).

(*a*) Lubricate the equipment in accordanc with LO 5-4310-354-12, figure 3-1.

(*b*) Fill fuel tank and engine cooling system Refer to tabulated data, paragrap 1-10.*b*. for capacities. Refer to table 2-1 for antifreeze data.

Table 2-1. Freezing Points, Composition, and Specific Gravities of Military Antifreeze Materials

Lowest Expected Ambient Temp.		Inhibited Glycol per Gallon/Liters of Coolant[1]		Compound, Antifreeze Arctic [2]	Ethylene Glycol Solution Specific Gravity at 68°F (20°C)[3]
°F	°C	Pints	Liters		
+20	−7	1½	0.71	Issued full strength and ready mixed for 0° to −65°F (−18° to −54°C) temperatures for both initial installation and replenishment of losses.	1.022
+10	−12	2	0.95		1.036
0	−18	2¾	1.30		1.047
−10	−23	3¼	1.54		1.055
−20	−29	3½	1.66		1.062
−30	−34	4	1.89		1.067
−40	−40	4¼	2.01		1.073
−50	−46	Arctic Antifreeze preferred		DO NOT DILUTE WITH WATER OR ANY OTHER SUBSTANCE	
−60	−51				
−75	−59				

[1] Maximum protection is obtained at 60 percent by volume [4.8 pints (2.27 liters) of ethylene glycol per gallon (3.785 liters) of solution].

[2] Military Specification MIL-C-11755 Arctic type, nonvolatile antifreeze compound is intended for use in the cooling system of liquid-cooled internal combustion engines. It is used for protection against freezing primarily in Arctic regions where ambient temperature remains for extended periods close to −40°F (−40°C) or drops below, to as low as −90°F (−68°C).

[3] Use an accurate hydrometer. To test hydrometer, use 1 part ethylene glycol antifreeze to 2 parts water. This should produce a hydrometer reading 0°F (−17.8°C).

NOTE: Fasten a tag near the radiator filler cap indicating the type antifreeze.

WARNING

To prevent serious burns when filling battery, take precautions against spilling electrolyte on clothing or allowing it to come in contact with skin or eyes. Use rubber gloves.

(*c*) Fill battery with electrolyte to a level of approximately ⅜ inch (9.525 mm) above plates. Specific gravity must be 1.250 or higher when checked with a hydrometer. (Refer to TM 9-6140-200-15.)

(*d*) For cold weather operation, refer to LO 5-4310-354-12 (figure 3-1) and table 2-1.

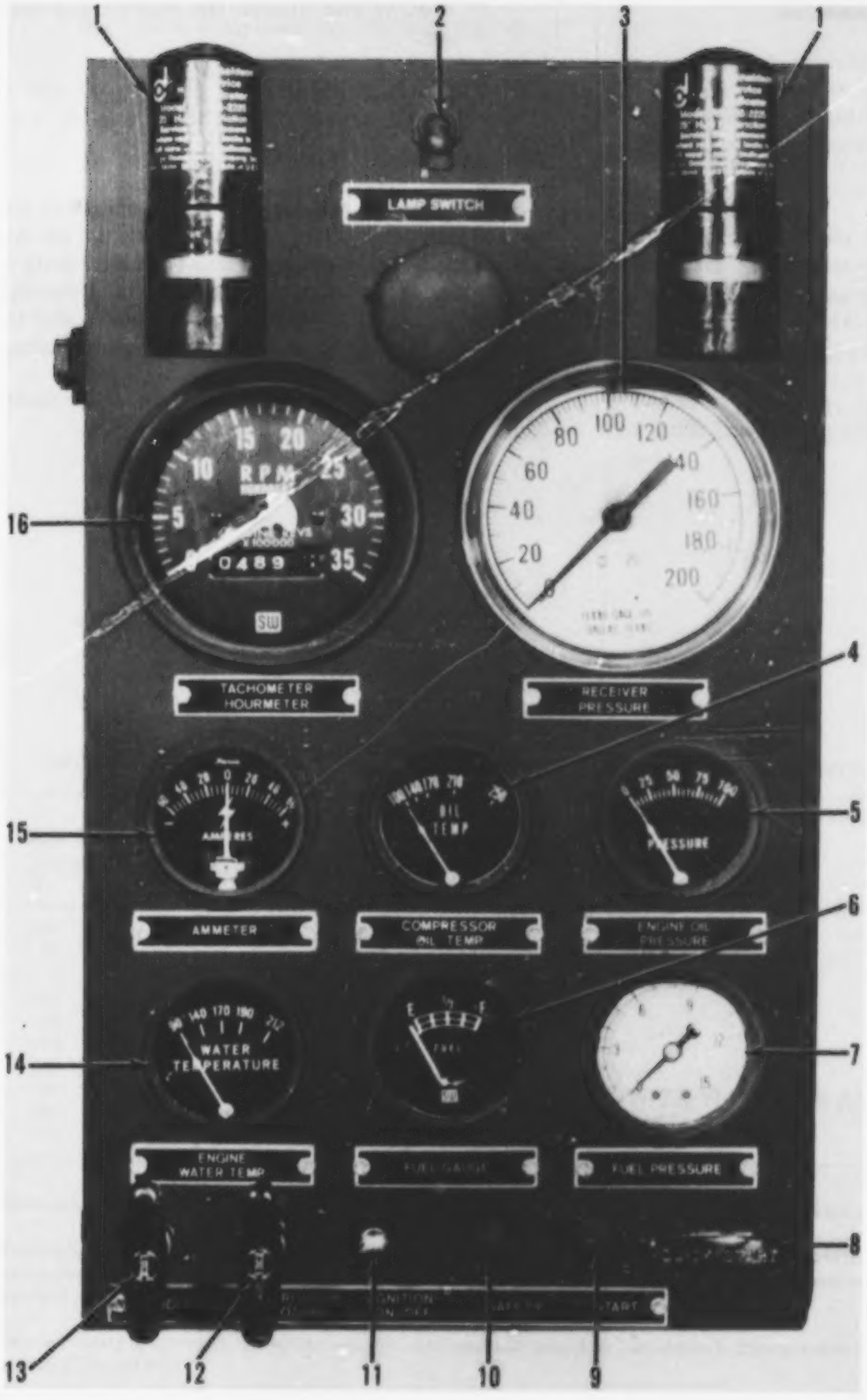
b. Installation of Separately Packed Components.

(1) Remove and unpack the muffler and rain cap.

(2) Install the muffler in coupling on end of engine exhaust piping above housing roof.

c. Controls and Instruments. Before operating the air compressor unit, you, the operator, should become familiar with all of the controls and instruments to ensure proper operation of the equipment. A description and function of each of these controls and instruments is outlined in the following paragraphs.

(1) *Instrument panel controls and instruments* (figure 2-3).


1
2
3
1
LAMP SWITCH
16
TACHOMETER HOURMETER
RECEIVER PRESSURE
4
15
AMMETER
COMPRESSOR OIL TEMP
ENGINE OIL PRESSURE
5
6
14
7
ENGINE WATER TEMP
FUEL GAUGE
FUEL PRESSURE
8
13
12
11
10
9

1. RESTRICTION INDICATOR (2)
2. LAMP SWITCH
3. RECEIVER PRESSURE GAUGE
4. COMPRESSOR OIL TEMP GAUGE
5. ENGINE OIL PRESSURE GAUGE
6. FUEL LEVEL GAUGE
7. FUEL PRESSURE GAUGE
8. QUICK-START CONTROL HANDLE
9. START SWITCH
10. SAFETY SWITCH
11. IGNITION SWITCH
12. COMPRESSOR UNLOADER HANDLE
13. IDLE CONTROL HANDLE
14. ENGINE WATER TEMP GAUGE
15. AMMETER
16. TACHOMETER-HOURMETER

TS5-4310-354-14/2-3

Figure 2-3. Instrument panel controls and instruments.

(*a*) *Air cleaner restriction indicators.* These indicators monitor the air pressure drop through the air cleaners (engine and compressor intake). As long as the pressure drop is within satisfactory limits, the indicators show green. When intake air is restricted by dirty air cleaner elements, or any other reason, the indicators show red. After the restriction is cleared by cleaning the air cleaner elements, or removing restriction, the indicators must be reset. Reset by pressing down on top of the indicator cap until green is showing.

(*b*) *Lamp switch.* This toggle switch operates the instrument panel lamp. A switch plate indicates the ON and OFF positions. The ignition switch must be in the ON position to energize the lamp switch.

(*c*) *Receiver pressure gauge.* This gauge indicates the pressure of the compressed air in the oil separator tank. Normal operating range is 80 to 105 PSI (5.6 to 7.4 KG/CM^2).

(*d*) *Engine water temperature gauge.* This gauge indicates the temperature of the engine cooling water. Normal operating temperature range after warm-up is 160° to 190°F (71° to 88°C).

(*e*) *Engine oil pressure gauge.* This gauge indicates the engine lubricating oil pressure being circulated through the engine. Normal operating range is 40 to 60 PSI (2.8 to 4.2 KG/CM^2) at full load and 15 to 25 PSI (1.1 to 1.8 KG/CM^2) at idle.

(*f*) *Fuel Gauge.* The fuel gauge indicates the level of fuel oil contained in the fuel tank. Capacity of the fuel tank is 19 gallons (72 liters).

(*g*) *Fuel pressure gauge.* This gauge indicates the pressure of the fuel oil in the engine fuel system. Normal fuel pressure is 3 to 5 PSI (0.2 to 0.4 KG/CM^2).

(*h*) *Quick-start control cable.* This control cable is used to inject cold weather starting aid fuel into the engine air intake.

NOTE

Do not actuate this control cable at temperatures above 40°F (4.4°C).

(*i*) *Start switch.* The engine pushbutton start switch is pressed to energize the starting motor solenoid for cranking the engine. This switch must be pressed simultaneously with the safety pushbutton switch when starting the engine.

(*j*) *Safety switch.* The safety pushbutton switch is pressed simultaneously with the start switch when starting the engine. Pressing the switch overrides the normally open engine oil pressure safety switch. The switch is held in until oil pressure of 4 PSI (0.3 KG/CM^2) is indicated on the engine oil pressure gauge.

(*k*) *Ignition on-off switch.* The ignition on-off switch is pulled outward to the ON position to energize the unit electrical system for starting. The switch remains in the ON position during operation. To stop the engine, the switch is pushed in to the OFF position. This action interrupts the fuel injection pump solenoid circuit, which is energized to run, thereby shutting off fuel supply to engine.

(*l*) *Compressor unloader control cable.* This control cable is used to actuate the compressor intake valve plate. Closing the valve plate allows the unit to be started with the compressor unloaded. The control cable handle is turned counterclockwise to unlock and then pulled outward to close valve plate (unload compressor). The handle is then turned clockwise to lock in position. Unlock handle, push in, and lock when operating temperature of engine is achieved.

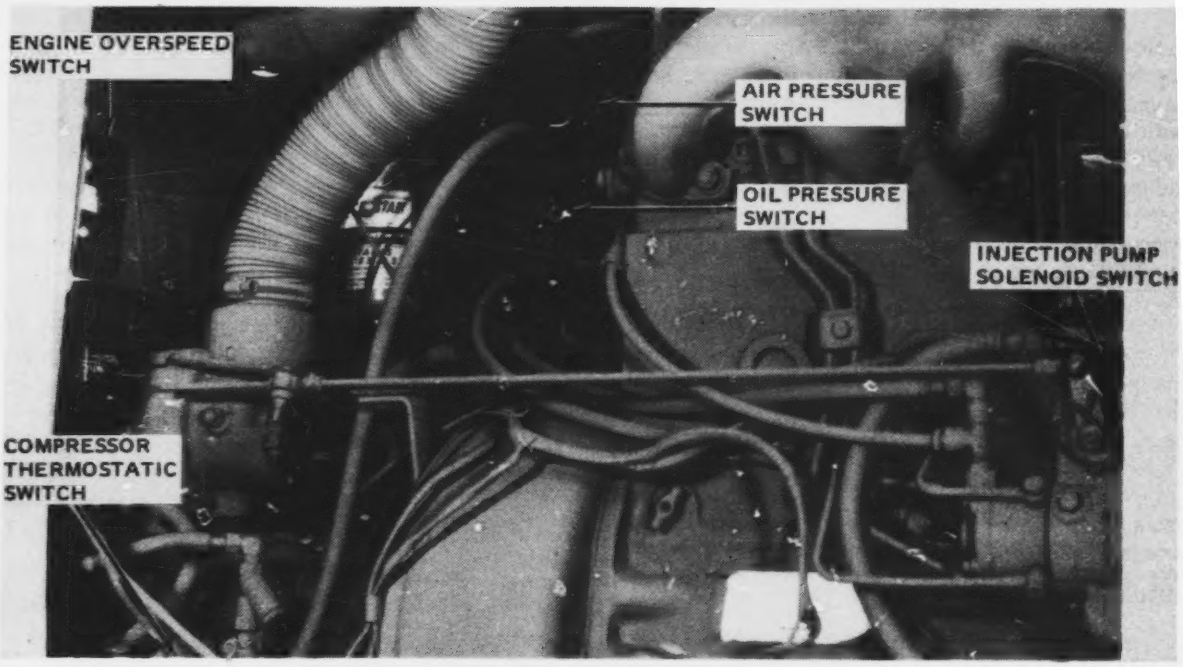
(*m*) *Idle control cable.* The idle control cable is used to manually set engine speed in idle position for starting. Turn handle counterclockwise to unlock, pull handle outward until it stops; then turn handle clockwise to lock. When operating temperature is achieved, unlock handle, push in, and lock.

(*n*) *Compressor oil temperature gauge.* This gauge indicates the temperature of the compressor system oil. Normal operating temperature range is 170° to 220°F (77° to 104°C).

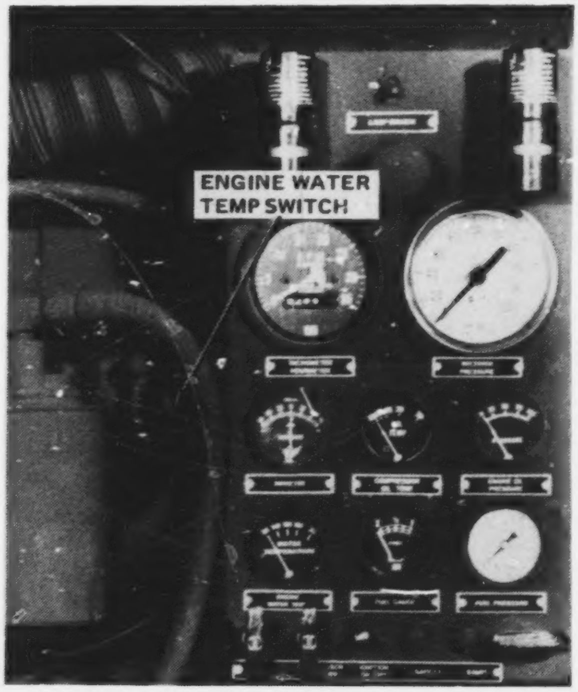
(*o*) *Ammeter.* The ammeter indicates the rate of battery charge or discharge.

(*p*) *Tachometer-hourmeter.* This gauge indicates the speed of the engine in revolutions per minute (rpm). Normal operating speed is 1100 ± 50 rpm when compressor is operating unloaded and 2200 ± 50 rpm full load. The gauge also records elapsed engine running time in hours and tenths of hours.

(2) *Safety circuit switches (figure 2-4).*


ENGINE OVERSPEED SWITCH
AIR PRESSURE SWITCH
OIL PRESSURE SWITCH
INJECTION PUMP SOLENOID SWITCH
COMPRESSOR THERMOSTATIC SWITCH

A OVERSPEED SWITCH, PRESSURE SWITCHES, SOLENOID SWITCH, AND THERMOSTATIC SWITCH


ENGINE WATER TEMP SWITCH

B WATER TEMPERATURE SWITCH

TS5-4310-354-14/2-4

Figure 2-4. Safety circuit switches.

(*a*) *Engine water temperature safety switch.* This normally closed temperature sensing device will shut down the engine if engine coolant temperature should reach 210° to 220°F (99° to 104°C). When the temperature safety switch opens at this temperature, the energized-to-run fuel injection pump solenoid circuit is interrupted causing fuel supply to be shut off to engine.

(*b*) *Engine oil pressure safety switch.* This normally open pressure sensing device will shut down the engine, if engine oil pressure should drop below 4 pounds (1.8 KG). The oil pressure safety switch is wired to the fuel injection pump energized-to-run solenoid. When the pressure switch closes, this circuit is interrupted causing fuel supply to the engine to be shut off. When starting, the safety pushbutton switch on the instrument panel must be pressed to override this switch.

(*c*) *Air pressure safety switch.* This normally closed pressure sensing device is wired in series between starting motor and starting pushbutton switch. The air pressure safety switch opens at 10 PSI (0.7 KG/CM^2) and will prevent starting the engine if the switch is open due to this pressure being in the air system.

(*d*) *Engine overspeed safety switch.* This switch is an electronic type switch activated by a transmitter sending unit connected to the engine tachometer drive. The overspeed switch is normally open and closes if engine speed should exceed 2350 RPM. The overspeed switch is wired to the fuel injection pump energized-to-run solenoid. When overspeed switch opens, the circuit is interrupted causing fuel to the engine to be shut off. If overspeed should occur, the overspeed switch must be manually reset.

(*e*) *Thermostatic safety switch.* This normally closed temperature sensing device will shut down the engine if the compressed air/oil mixture being discharged from the compressor reaches 230° to 240°F (110° to 116°C). The switch is wired to the fuel injection pump energized-to-run solenoid. When switch opens, the circuit is interrupted causing fuel to the engine to be shut off.

(*f*) *Fuel injection pump solenoid.* The fuel injection pump incorporates an electrical shutoff, energized-to-run, solenoid. The circuit to the solenoid is energized when ignition switch on instrument panel is pulled to the ON position and de-energized when ignition is OFF. The injection pump circuit is also interrupted by the safety devices incorporated in the unit, with exception of the air pressure safety switch. When the safety devices interrupt the injection pump solenoid circuit, spring action within the injection pump causes the fuel metering valve to close. This action stops the flow of fuel to the injection nozzles and the engine will stop.

(3) *Air discharge service valves (figure 2-5).* These manually operated service valves control the flow of compressed air being discharged from the oil separator tank through the minimum pressure valve assembly. The service valve on the hose reel controls the flow of air through the hose mounted on the reel. The other service valves are for the attachment of additional hoses.

(4) *Oil separator safety valve (figure 2-* This safety valve is a pressure relief type device. It normally closed and set to open at 125 PSI (8. KG/CM^2) should pressure in oil separator exceed th pressure. When pressure drops below safety val setting, the valve will close. No manual reset is quired.

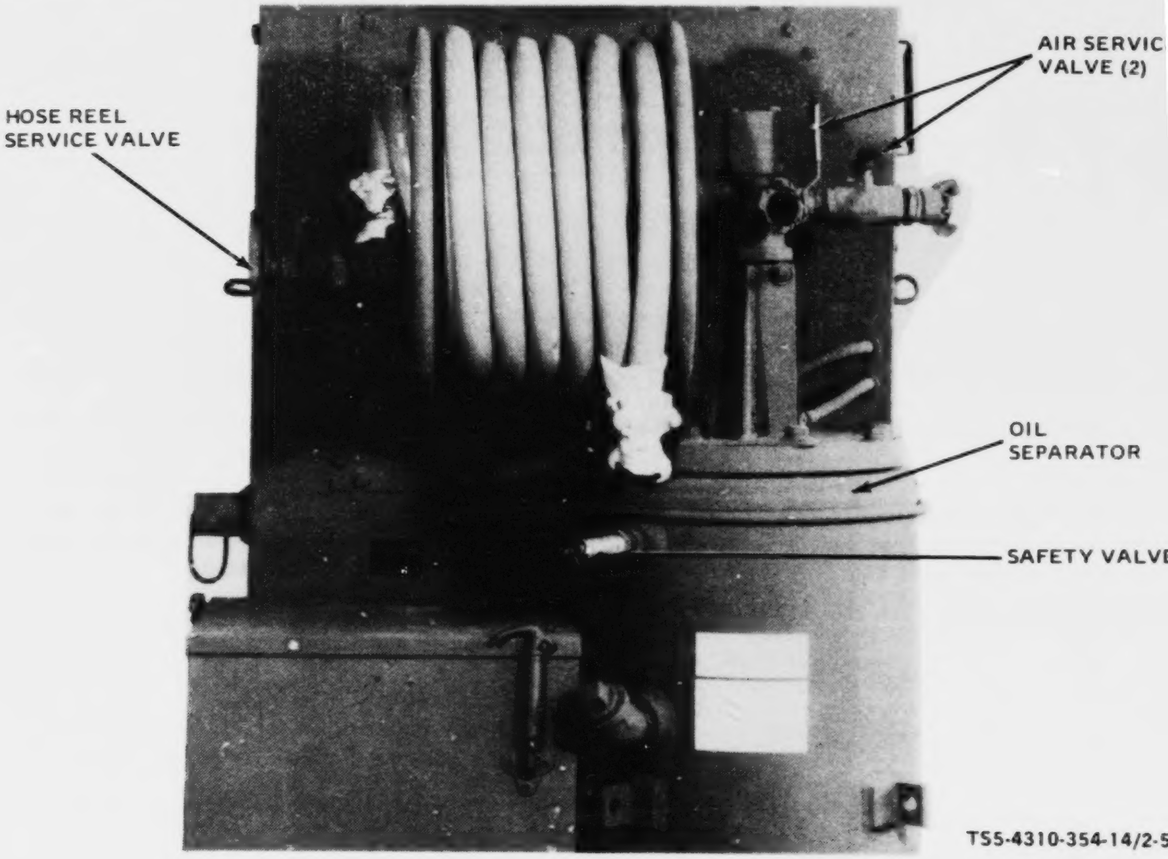

AIR SERVIC
VALVE (2)
HOSE REEL SERVICE VALVE
OIL SEPARATOR
SAFETY VALV
TS5-4310-354-14/2-5

Figure 2-5. Air discharge service valves and safety valve.

2-2. Operation Under Usual Conditions.

a. General. The following instructions and information are for the guidance of personnel responsible for the operation of this equipment. The operator must know how to perform every operation of which the unit is capable. The following paragraphs contain instructions for starting, operating, and stopping. Since nearly every job presents a different task, the operator may have to vary given procedures to fit the specific condition.

b. Starting the Equipment.

(1) Open the unit housing doors on both sides and perform the necessary daily and before operation preventive maintenance checks and services (table 3-1).

(2) Check air demand requirements for task to be performed.

CAUTION

Operating the compressor unit below 80 PSI (5.6 KG/CM^2) may cause overheating of compressor and excessive oil consumption. Make certain pressure regulator is set properly and that minimum pressure valve is functioning. Make certain the air demand for task being performed does not exceed capacity of the unit.

(3) Refer to figure 2-6 and start the air compressor unit.

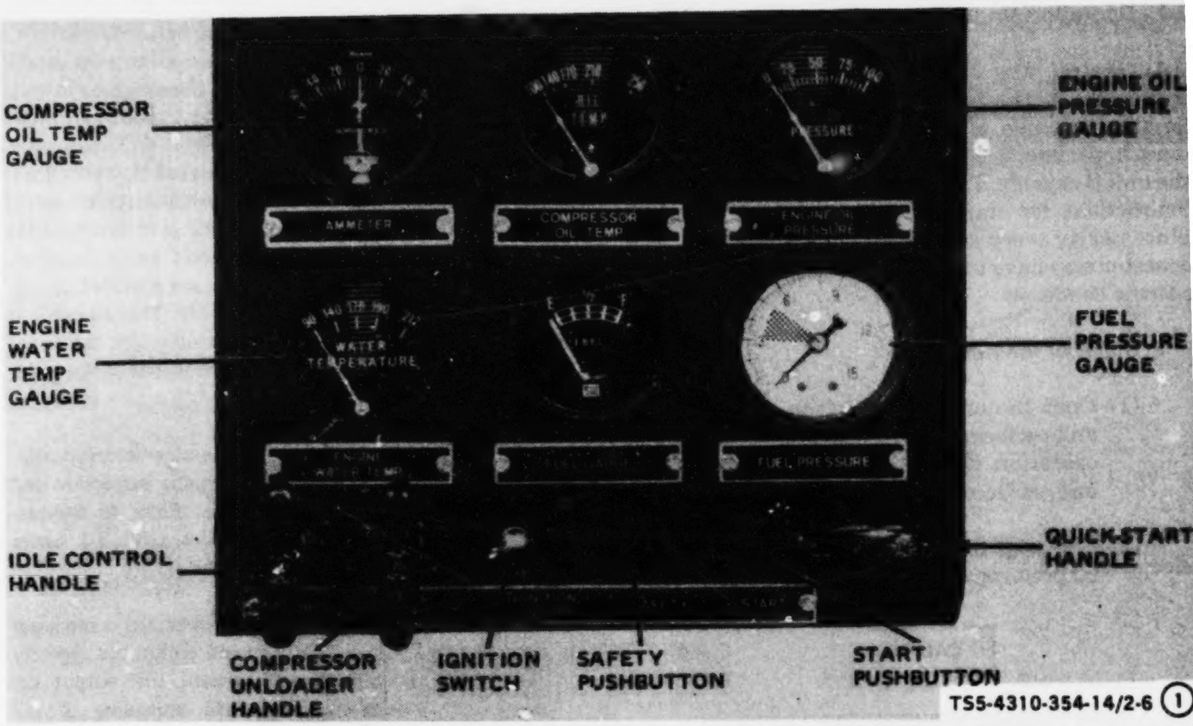
c. Operation of Equipment.

(1) The air compressor unit is designed to supply compressed air for the operation of pneumatic tools used in general construction work. Three discharge connections are provided for attaching penumatic tools and accessories. Two connections, with service valves, are provided on top of the minimum pressure valve assembly. This assembly is located on top of the oil separator assembly. The third connection is on the hose reel. The connections are of the quick disconnect type.

(2) The air compressor unit operates automatically after starting and warm-up. Only periodic inspection and servicing is required during operation. Refer to the preventive maintenance checks and services, table 3-1, under the during operation heading.

(3) As operating air demand increases, the compressor output increases to meet the demand within the capacity of the unit. When demand decreases, the output decreases. This automatic loading and unloading of the compressor maintains a continuous supply of compressed air. Make certain that air demand does not exceed the unit capability of 125 CFM at 100 PSI ($3.5M^3/MIN$ at $7KB/CM^2$).

(4) The operator should observe the various gauges periodically to ensure that unit is operating properly and that no malfunction exists.


COMPRESSOR OIL TEMP GAUGE
ENGINE OIL PRESSURE GAUGE
AMMETER
COMPRESSOR OIL TEMP
ENGINE OIL PRESSURE
ENGINE WATER TEMP GAUGE
WATER TEMPERATURE
FUEL
FUEL PRESSURE GAUGE
ENGINE WATER TEMP
FUEL PRESSURE
IDLE CONTROL HANDLE
QUICK-START HANDLE
START
COMPRESSOR UNLOADER HANDLE
IGNITION SWITCH
SAFETY PUSHBUTTON
START PUSHBUTTON

TS5-4310-354-14/2-6 ①

STEP 1. CLOSE ALL AIR DISCHARGE SERVICE VALVES (FIG 2-5).

STEP 2. PRESS START PUSHBUTTON AND HOLD FOR THREE SECONDS TO CRANK ENGINE TO ENSURE THAT THERE IS NO ENGINE SEIZURE; THEN, RELEASE START SWITCH.

STEP 3. PULL IGNITION SWITCH TO ON POSITION (OUTWARD). SWITCH PANEL LAMP SWITCH ON, IF NECESSARY, TO ILLUMINATE INSTRUMENT PANEL.

STEP 4. TURN COMPRESSOR UNLOADER CONTROL CABLE HANDLE COUNTERCLOCKWISE TO UNLOCK PULL HANDLE OUTWARD UNTIL IT STOPS; THEN, TURN HANDLE CLOCKWISE TO LOCK.

STEP 5. PRESS START PUSHBUTTON AND SAFETY PUSHBUTTON SIMULTANEOUSLY.

CAUTION

DO NOT CRANK ENGINE CONTINUOUSLY FOR MORE THAN 30 SECONDS. ALLOW A 2 MINUTE COOLING PERIOD BETWEEN STARTING ATTEMPTS. IF ENGINE DOES NOT START AFTER A FEW TRIES, DETERMINE CAUSE OR REPORT CONDITION TO ORGANIZATIONAL MAINTENANCE.

STEP 6. RELEASE START PUSHBUTTON AS SOON AS ENGINE STARTS BUT CONTINUE TO HOLD IN SAFETY PUSHBUTTON. RELEASE SAFETY PUSHBUTTON WHEN ENGINE OIL PRESSURE GAUGE INDICATES OIL PRESSURE IS ACHIEVED.

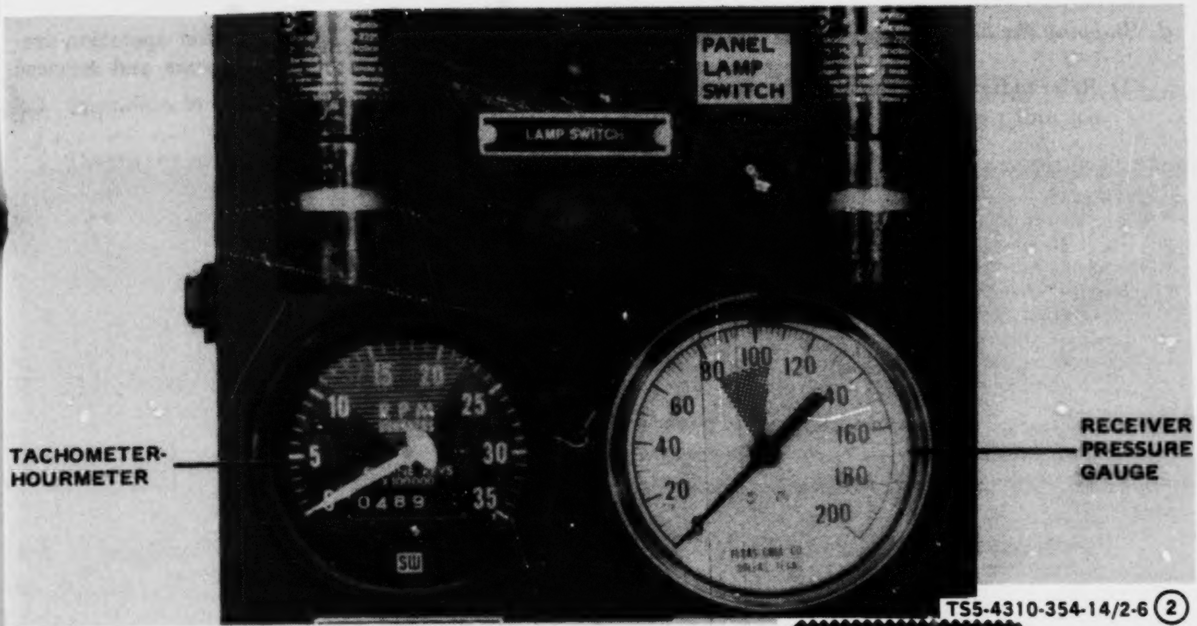
CAUTION

IF ENGINE OIL PRESSURE IS NOT INDICATED ON GAUGE WITHIN 3 SECONDS AFTER ENGINE STARTS, RELEASE SAFETY PUSHBUTTON. DETERMINE CAUSE OR REPORT CONDITION TO ORGANIZATIONAL MAINTENANCE.

NOTE

IF WEATHER IS COOL, BELOW 40°F (4.4°C), PERFORM STEPS 1 THROUGH 4; THEN, PULL QUICK-START CONTROL CABLE HANDLE OUTWARD AND HOLD OUT FOR 2 TO 3 SECONDS (TO FILL VALVE CHAMBER). THEN, WHILE PERFORMING STEPS 5 AND 6 PUSH QUICK-START HANDLE IN; HOLD FOR 2 TO 3 SECONDS. IF ENGINE DOES NOT START IMMEDIATELY, ACTUATE QUICK-START AGAIN.

Figure 2-6. Air compressor unit starting procedures (sheet 1 of 2).



TS5-4310-354-14/2-6 ②

STEP 7. AFTER ENGINE STARTS, TURN IDLE CONTROL CABLE HANDLE COUNTERCLOCKWISE TO UNLOCK AND PULL HANDLE OUTWARD TO INCREASE ENGINE SPEED TO FAST IDLE OF APPROXIMATELY 1500 RPM.TURN HANDLE CLOCKWISE TO LOCK. OBSERVE SPEED ON TACHOMETER-HOURMETER. ALLOW ENGINE TO RUN AT FAST IDLE UNTIL ENGINE WATER TEMPERATURE GAUGE INDICATES APPROXIMATELY 140°F (60°C).

STEP 8. UNLOCK IDLE CONTROL CABLE HANDLE, PUSH IN HANDLE AND LOCK. UNLOCK COMPRESSOR UNLOADER CONTROL CABLE HANDLE, PUSH IN HANDLE AND LOCK.

STEP 9. UNIT IS NOW OPERATING IN THE LOAD CONFIGURATION. OBSERVE AND CHECK READINGS OF ALL ENGINE AND COMPRESSOR GAUGES.

STEP 10. WHEN UNIT HAS REACHED OPERATING PRESSURE OF 105 PSI MAXIMUM (7.4 KG/CM^2), COMPRESSOR WILL AUTOMATICALLY UNLOAD. UNIT IS NOW READY FOR OPERATION.

CAUTION

DO NOT OPERATE THE COMPRESSOR UNIT WITH LESS THAN 80 PSI (5.6 KG/CM^2) IN THE OIL SEPARATOR TANK. IF AIR DEMAND IS SUCH TO CAUSE PRESSURE TO DROP BELOW 80 PSI (5.6 KG/CM^2), REDUCE AIR DEMAND BY PARTIALLY CLOSING DISCHARGE SERVICE VALVE (FIG 2-5).

STEP 11. CONNECT PNEUMATIC TOOLS TO DISCHARGE SERVICE VALVE CONNECTORS. OPEN THE SERVICE VALVE(S) AS REQUIRED FOR TOOLS BEING USED. NORMAL UNIT OPERATING PRESSURE RANGE IS 80 PSI (5.6 KG/CM^2) LOAD TO 105 PSI (7.4 KG/CM^2) UNLOAD.

NOTE

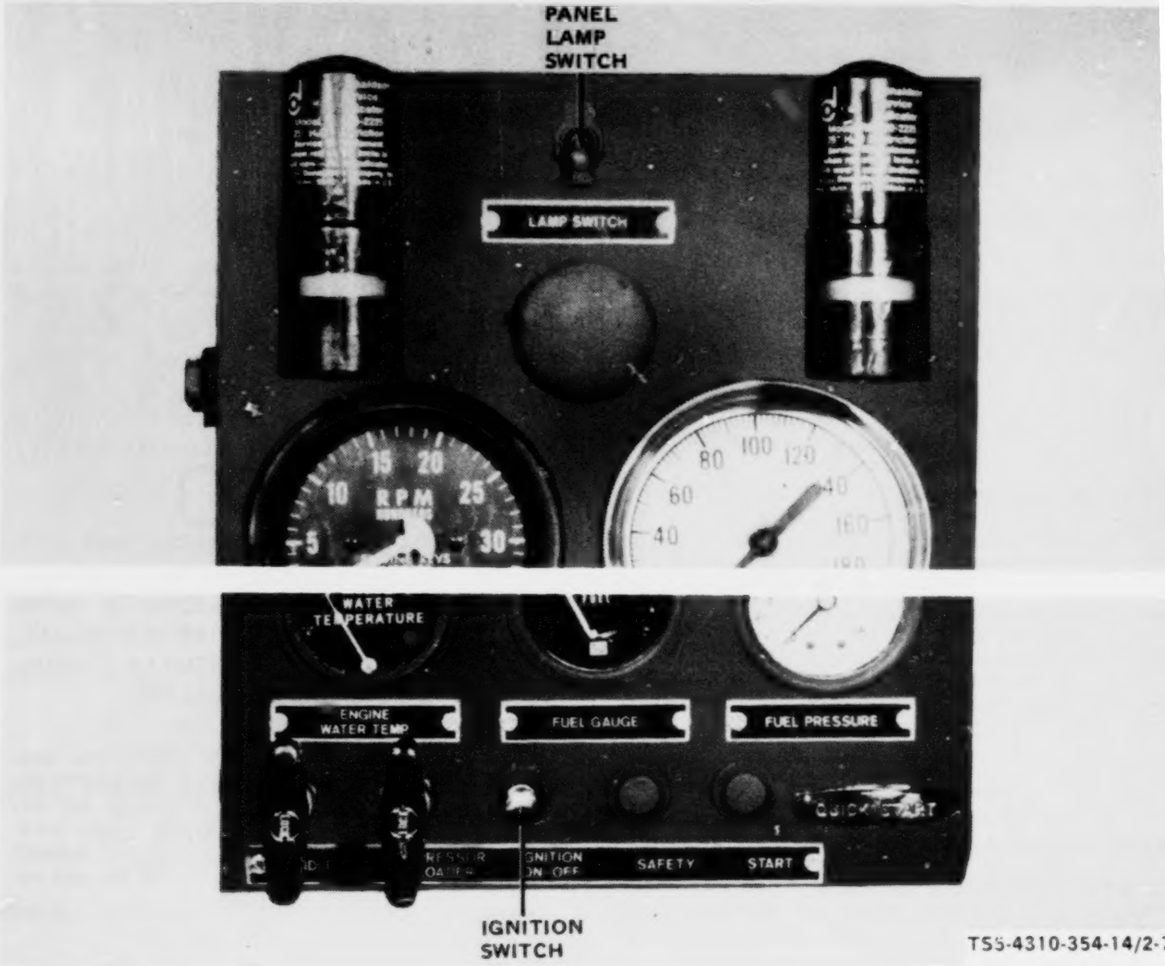
THIS UNIT IS EQUIPPED WITH SAFETY DEVICES (FIG 2-4) WHICH AUTOMATICALLY STOPTHE ENGINE DUE TO: HIGH TEMPERATURE COMPRESSOR OIL, HIGH TEMPERATURE ENGINE COOLANT, LOW ENGINE OIL PRESSURE, AND ENGINE OVERSPEED. IF ENGINE STOPS DURING OPERATION FOR ONE OF THESE REASONS, DETERMINE CAUSE OR REPORT CONDITION TO ORGANIZATIONAL MAINTENANCE BEFORE ATTEMPTING TO START AGAIN. ALL SAFETY DEVICES ARE AUTOMATIC RESET, EXCEPT ENGINE OVERSPEED WHICH IS MANUAL.

Figure 2-6. Air compressor unit starting procedures (sheet 2 of 2).

d. Stopping the Equipment.

(1) Refer to figure 2-7 and stop the air compressor unit.

(2) Perform the necessary after operation p
ventive maintenance checks and servi
(table 3-1).


PANEL
LAMP
SWITCH
LAMP SWITCH
R P M
5
10
15
20
25
30
40
60
80
100
120
140
160
WATER
TEMPERATURE
ENGINE
WATER TEMP
FUEL GAUGE
FUEL PRESSURE
QUICK START
IGNITION
ON OFF
SAFETY
START
IGNITION
SWITCH
TS5-4310-354-14/2-

STEP 1. CLOSE ALL DISCHARGE SERVICE VALVES (FIG 2-5). DISCONNECT AND STOW PNEUMATIC TOOLS THAT WERE BEING USED FOR THE JOB.

STEP 2. ALLOW UNIT TO RUN UNLOADED FOR FIVE MINUTES.

STEP 3. SWITCH THE PANEL LAMP SWITCH TO OFF.

STEP 4. PUSH IGNITION SWITCH IN TO OFF POSITION.

NOTE

THIS UNIT IS EQUIPPED WITH SAFETY DEVICE
(FIG 2-4) WHICH AUTOMATICALLY STOP THE EI
GINE DUE TO: HIGH TEMPERATURE COMPRESSO
OIL, HIGH TEMPERATURE ENGINE COOLANT, LO
ENGINE OIL PRESSURE, AND ENGINE OVERSPEE
IF ENGINE STOPS DURING OPERATION FOR ONE O
THESE REASONS, DETERMINE CAUSE OR REPOR
CONDITION TO ORGANIZATIONAL MAINTENANC
BEFORE ATTEMPTING TO START AGAIN. AL
SAFETY DEVICES ARE AUTOMATIC RESET, EXCEP
ENGINE OVERSPEED WHICH IS MANUAL.

Figure 2-7. Air compressor unit stopping procedure.

Section II. OPERATION UNDER UNUSUAL CONDITIONS

2-3. Operation in Extreme Heat.

a. Locate the air compressor unit in a well ventilated area. Always keep side housing doors open during operation to promote good air circulation. Make certain there are no obstructions preventing air circulation through oil cooler and radiator.

b. Keep engine cooling system clean and full of coolant. Check coolant level and inspect cooling system often. Report any leaks or other malfunctions to organizational maintenance.

c. Keep air compressor unit lubricated in accordance with LO 5-4310-354-12, figure 3-1.

2-4. Operation in Extreme Cold (Below 0°F (−17.8°C)).

a. Ensure that antifreeze solution is correct for lowest temperature anticipated. Refer to table 2-1 for antifreeze data.

b. Inspect cooling system for evidence of leaks. Correct or report any defect to organizational maintenance.

c. Keep battery fully charged. After adding water to battery, run engine for at least one hour.

d. Keep fuel tank full when unit is not in operation. Refer to tabulated data, paragraph 1-10.*b* for fuel type and tank capacity.

e. Lubricate the air compressor unit in accordance with LO 5-4310-354-12, figure 3-1.

f. Allow engine to reach operating temperature before applying compressor load.

2-5. Operation Under Rainy or Humid Conditions.

a. Wipe dry all exposed areas frequently.

b. Cover air compressor unit when not in use, after unit has cooled to approximately ambient temperature.

c. Inspect air cleaners and oil reservoirs frequently for contamination. Service in accordance with LO 5-4310-354-12, figure 3-1.

2-6. Operation in High Altitudes.

CAUTION

Check unit frequently for overheating of engine during high altitude operation.

This air compressor unit operates satisfactorily at high altitudes. However, since barometric pressure (air density) decreases as altitude increases, a slight loss of compressor efficiency may be noticed. This is a normal condition and cannot be prevented.

2-7. Operation in Dusty or Sandy Areas. A highly contaminated dusty or sandy area places an extra load on the air cleaners, oil filters, engine, and compressor. This condition may increase wear and maintenance. Servicing of the equipment should be performed at shorter intervals as inspection reveals the presence of contamination in oil reservoirs and air cleaners.

WARNING

Do not operate air compressor unit in an enclosed or sheltered area unless the exhaust gases are piped outside. Failure to do so could result in serious illness or death.

a. Locate the air compressor unit in a sheltered area if possible. Pipe exhaust gases outside of sheltered area.

b. Keep the entire unit as clean as possible. Check the oil cooler and radiator frequently for build-up of any obstruction.

c. Lubricate the unit at more frequent intervals, as inspection will dictate, in accordance with LO 5-4310-354-12, figure 3-1.

CHAPTER 3

OPERATOR/CREW MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

3-1. Lubrication Instructions.

a. General. Keep all lubricants in closed containers and store in a clean, dry area away from excessive heat. Do not allow dust, dirt, or other foreign matter to mix with the lubricants. Keep all lubrication equipment clean and ready for use.

b. Cleaning. Before lubricating the equipment, wipe all lubrication points to remove dirt and grease. After lubricating, clean all lubrication points of any spilled or excessively applied lubricant to prevent accumulation of dirt and foreign matter. Keep all external surfaces and parts not requiring lubrication free of lubricants.

3-2. Points of Lubrication. Service the points of lubrication at proper intervals as specified on LO 5-4310-354-12, figure 3-1.

CAUTION

Use only the type lubricants specified on current lubrication order and do not over lubricate. Over lubrication may cause equipment failure or damage to working parts.

a. Operation Immediately After Lubrication. Inspect all oil lines, fittings, and filters for leaks immediately after lubrication and during operation.

LUBRICATION

ORDER

LO5-4310-354-12

COMPRESSOR, ROTARY: AIR; SKID MTD; DIESEL ENGINE DRIVEN, 125 CFM, 100 PSIG

(DAVEY MODEL 6M125)

NSN 4310-01-043-7604

Reference: Sm 10-1-C4-1

Intervals and related task-hour times are based on normal hours of operation. The task-hour time specified is the time you need to do all the services prescribed for a particular interval. Change the interval if your lubricants are contaminated or if you are operating the equipment under adverse operating conditions, including longer than usual operating hours. You may extend the interval during periods of low activity, but you must take adequate preservation precautions.

Clean fittings before lubricating. Lubricate points indicated by dotted arrow shaft on both sides of equipment. Clean parts with SOLVENT, dry cleaning, or with OIL, fuel, diesel.

Dry before lubricating. Drain crankcase when HOT. Fill and check level. The lowest level of maintenance authorized to lubricate a point is indicated by one of the following: (C) Operator/crew, or (O) Organizational Maintenance.

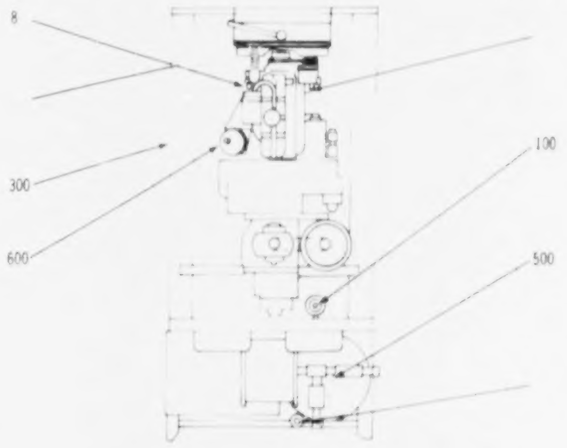
The time specified is the time required to perform all services at the particular interval.

FOLD

FOLD

LUBRICANT ● INTERVAL

INTERVAL ● LUBRICANT



Crankcase Oil Level Gage (Check Level) (C) (See note 5) — 8

Crankcase Oil Fill (O) (See Key) — OE/HDO

Crankcase Oil Drain (O) (Drain and refill) — 300

Engine Oil Filter (Disassemble, clean housing, renew element and reassemble) (O) (See Note 2) — 600

OE/HDO — Speed Control Linkage (See note 3) (C)

100 — Compressor Oil Filter (Disassemble, clean entire unit and reassemble) (See Note 4) (O)

500 — Oil Separator Drain Plug (Drain and refill) (O)

OHA — Oil Separator Filler Plug (See Key) (O)

TOTAL MAN-HR		TOTAL MAN-HR	
INTERVAL	MAN-HR	INTERVAL	MAN-HR
8	0.1	500	1.0
100	1.0	600	1.0
300	1.0		

Form 2273
1 Dec 76

Figure 3-1. Lubrication Order (Sheet 1 of 2)

L/O LAYOUT SHEET

-KEY-

LUBRICANTS		REFILL CAPACITY (APP)	EXPECTED TEMPERATURES			INTERVALS
			Above +32°F Above 0°C	+40°F to -10°F +5°C to -23°C	0°F to -65°F -18°C to -50°C	
OE/HDO (MIL-L-2104C)	LUBRICATING OIL Engine		OE/HDO 30	OE/HDO 10	OEA/APG-PD-1	Intervals given are in hours of normal operation
	Engine Crankcase (Add one additional quart for filter	6 qt (5.68L)				
	Oil Can Points					
OEA/APG-PD-1	OIL, Engine Subzero					
OHA (MIL-L-15016)	HYDRAULIC FLUID, Oil Separator	4 gal (15.14L)	OHA			

NOTES:

1. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10°F (-23°C). Remove lubricants prescribed in the key for temperatures above -10°F (-23°C). Clean parts with SOLVENT dry-cleaning. Relubricate with lubricants specified in the key for temperatures below -10°F (-23°C).

2. OIL FILTER. Replace engine oil filter every other engine oil change. After installing new filter element, fill crankcase, operate engine 5 minutes, check housing for leaks; check crankcase oil level and bring to full mark.

3. SPEED CONTROL LINKAGE. Lubricate linkage pivot points weekly, or as needed for free movement.

4. COMPRESSOR OIL FILTER. Clean oil filter every 100 hours of operation for the first 500 hours. clean every 500 hours thereafter and each time separator oil is changed.

5. CRANKCASE. Crankcase level may be checked with the engine in either a static or operating condition.

Copy of this Lubrication Order will remain with the equipment at all times; instructions contained herein are mandatory.

By Order of the Secretaries of the Army and the Air Force:

BERNARD W. ROGERS
Genral, United States Army
Chief of Staff

Official:
J. C. PENNINGTON
Brigadier General United States Army
The Adjutant General

DAVID C. JONES, General, USAF
Chief of Staff

Offical:
JAMES J. SHEPART, colonel, USAF
Director of Administration

FOLD

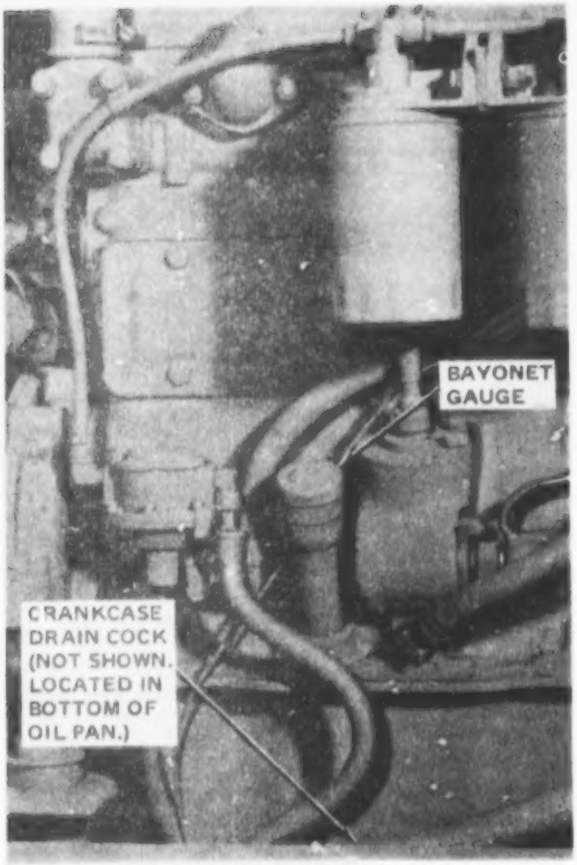
FOLD

Figure 3-1. Lubrication Order (Sheet 2 of 2)

b. Engine Lubrication (figure 3-2).

(1) Make certain the engine crankcase oil level is checked frequently. Oil consumption may increase at any time.

(2) The engine oil may require changing more frequently than usual during unusual operating conditions (Chapter 2, Section II). Extreme operating conditions can cause oil contamination by dilution and an increase in sludge formation.


BAYONET GAUGE
CRANKCASE DRAIN COCK (NOT SHOWN. LOCATED IN BOTTOM OF OIL PAN.)

TS5-4310-354-14/3-2

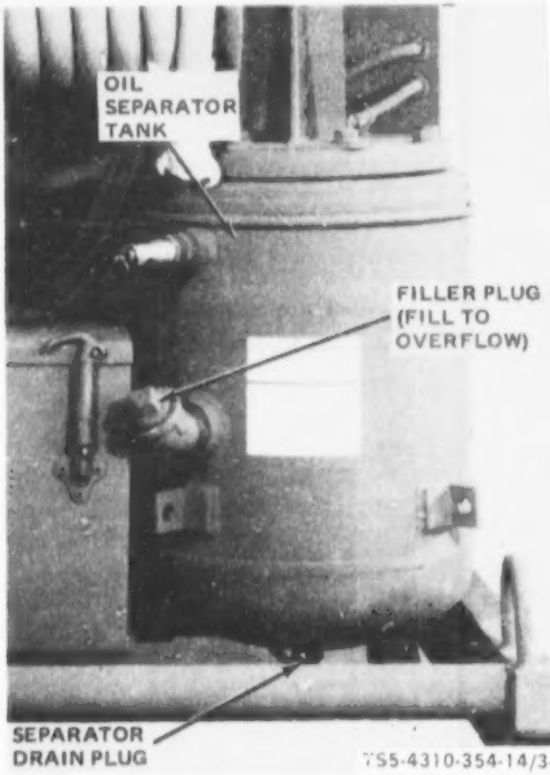
STEP 1. CHECK OIL LEVEL ON ENGINE BAYONET GAUGE, ADD OIL AS NECESSARY TO BRING LEVEL TO FULL MARK ON GAUGE. SEE LO5-4310-354-12, FIG 3-1.

STEP 2. OPEN ENGINE CRANKCASE DRAIN COCK TO DRAIN OIL FOR OIL CHANGE. WHEN OIL FLOW STOPS, CLOSE DRAIN COCK.

Figure 3-2. Engine crankcase service.

(3) The engine oil will be changed every
hours of operation if the available fuel us
has a sulphur content of more than 0.4 p
cent. The oil filter change can remain at t
normal specified time.

c. Compressor Lubrication. Lubrication of t
compressor is as specified in table 3-1, and as illu
trated in figure 3-3 under heading of oil separat
service.



TS5-4310-354-14/3

WARNING

**DO NOT REMOVE OIL FILLER PLUG WITH A
PRESSURE IN SEPARATOR TANK.**

STEP 1. REMOVE OIL SEPARATOR FILLER PL
AND CHECK OIL LEVEL. OIL SHOULD
VISIBLE IN FILLER ELBOW. FILL
OVERFLOW AS NECESSARY.
SEE LO5-4310-354-12, FIG 3-1.

STEP 2. REMOVE OIL SEPARATOR DRAIN PLUG
DRAIN OIL FOR OIL CHANGE. WHEN O
FLOW STOPS, INSTALL DRAIN PLUG.

Figure 3-3. Oil separator service.

d. Oil Filter Service. Service the engine oil filter and compressor oil filter as illustrated in figure 3-4 and 3-5 at intervals specified in table 3-1.

NOTE

ENGINE OIL FILTER IS THE SPIN-ON THROW-AWAY TYPE. REPLACE OIL FILTER AT EVERY OTHER OIL CHANGE.

STEP 1. USE A STRAP WRENCH, OR EQUIVALENT, TO REMOVE OIL FILTER. DISCARD OIL FILTER AND GASKET.

STEP 2. WIPE UNDERSIDE OF MOUNTING BASE ASSEMBLY WITH A CLEAN LINT-FREE CLOTH MOISTENED WITH CLEAN DIESEL FUEL OR A SUITABLE SOLVENT.

STEP 3. INSTALL A NEW GASKET AND OIL FILTER WHILE OIL IS DRAINED FROM THE ENGINE. USE STRAP WRENCH TO TIGHTEN OIL FILTER. MAKE CERTAIN GASKET AND FILTER SEAT PROPERLY IN MOUNTING BASE ASSEMBLY.

STEP 4. WHEN ENGINE IS STARTED AFTER OIL CHANGE, CHECK THE OIL FILTER FOR LEAKAGE AT MOUNTING BASE.

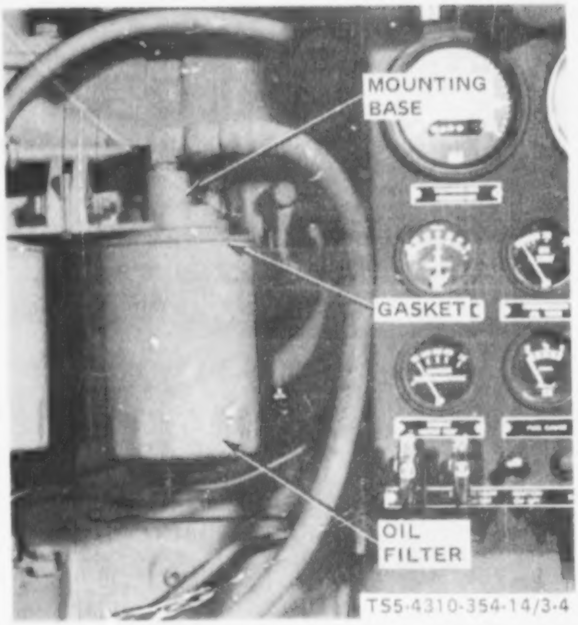
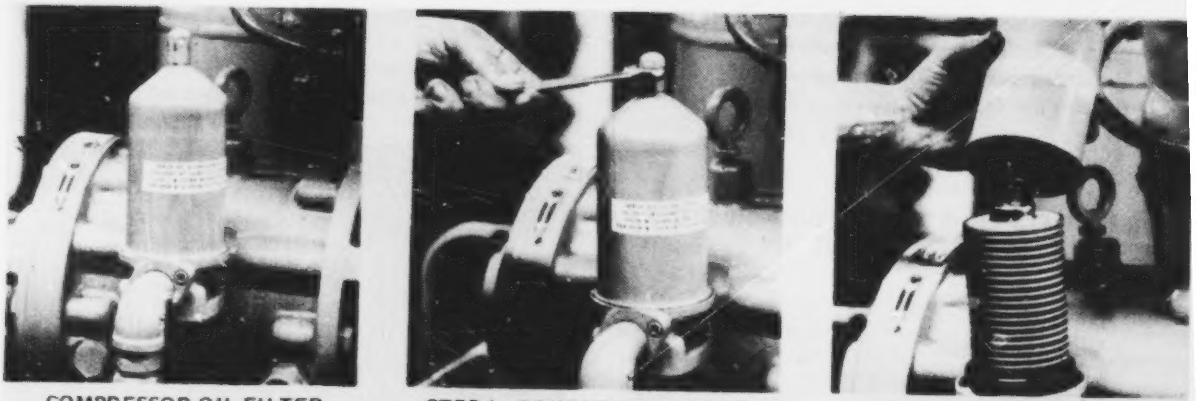


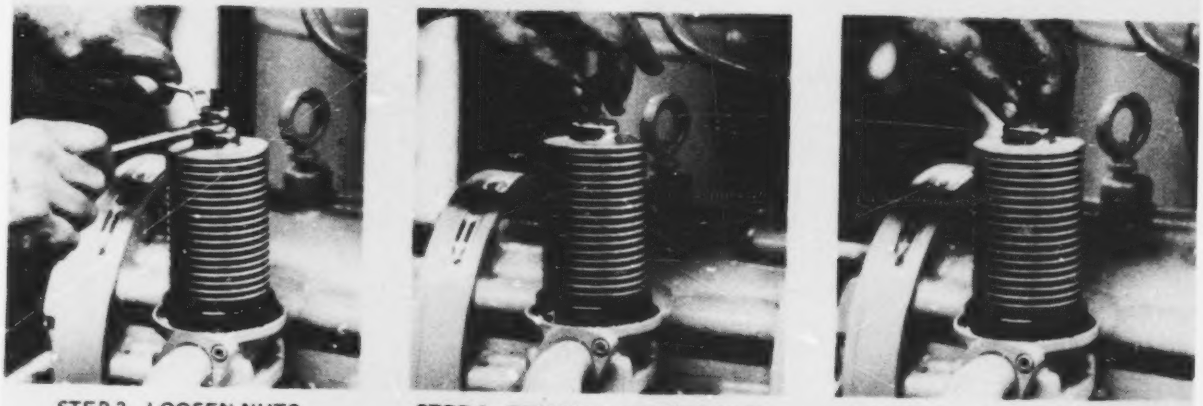
Figure 3-4. Engine oil filter service.



COMPRESSOR OIL FILTER

STEP 1. REMOVE COVER NUT.

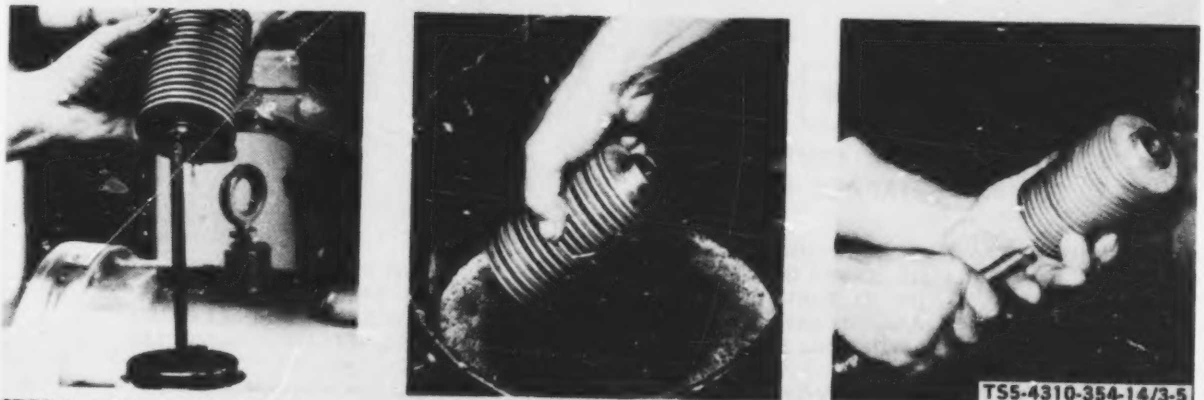
STEP 2. REMOVE COVER.



STEP 3. LOOSEN NUTS.

STEP 4. REMOVE LOCKING NUT.

STEP 5. REMOVE ELEMENT NUT AND WASHER.



TS5-4310-354-14/3-5

STEP 6. REMOVE THE ELEMENT.

STEP 7. WASH THE ELEMENT.

STEP 8. DRY THE ELEMENT.

Figure 3-5. Compressor oil filter service.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

3-3. Introduction.

a. The preventive maintenance checks and services (PMCS) listed in table 3-1 are provided to ensure that the rotary air compressor unit is ready for operation at all times. The unit must be inspected and serviced systematically so that defects can be discovered and corrected before serious damage or failure results. Defects discovered during operation that will not damage the unit will be noted for correction when operation has ceased. Stop the equipment immediately if a deficiency is noted that would damage the equipment if operation were continued.

b. All deficiencies and shortcomings will be recorded together with corrective action taken on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

c. Deleted.

d. Intervals for determining the daily PMCS are given in table 3-1 as follows:

(1) Column heading B, perform before operation.

(2) Column heading D, perform during operation.

(3) Column heading A, perform after operation.

e. When equipment is used continuously, and is shut down for refueling, the After Operation and Before Operation PMCS will be performed before restarting.

f. Deleted.

Table 3-1. Operator/Crew Preventive Maintenance Checks and Services

NOTE

Within designated interval, these checks are to be performed in the order listed.

B-Before D-During A-After

Item No.	Interval			Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available if:
	B	D	A			
					WARNING Death or serious injury may result if personnel fail to observe safety precautions while working on or around compressor. Be sure air pressure has been released before performing any maintenance or adjustments. NOTE Perform lubrication prior to or in conjunction with PMCS. Refer to LO 5-4310-354-12. Keep unit clean by wiping off dirt and oil during PMCS.	
1.	●			Compressor Assembly	Make the following walk around checks:	
					a. Check for evidence of fuel and oil leaks.	Fuel leakage or Class III oil leak is found.
					b. Check air lines, hoses, and couplings for cracks and deterioration.	
					c. Check fire extinguisher for broken seal and low charge.	Charge is low or extinguishe is missing.

Table 3-1. Operator/Crew Preventive Maintenance Checks and Services (continued)

B-Before D-During A-After

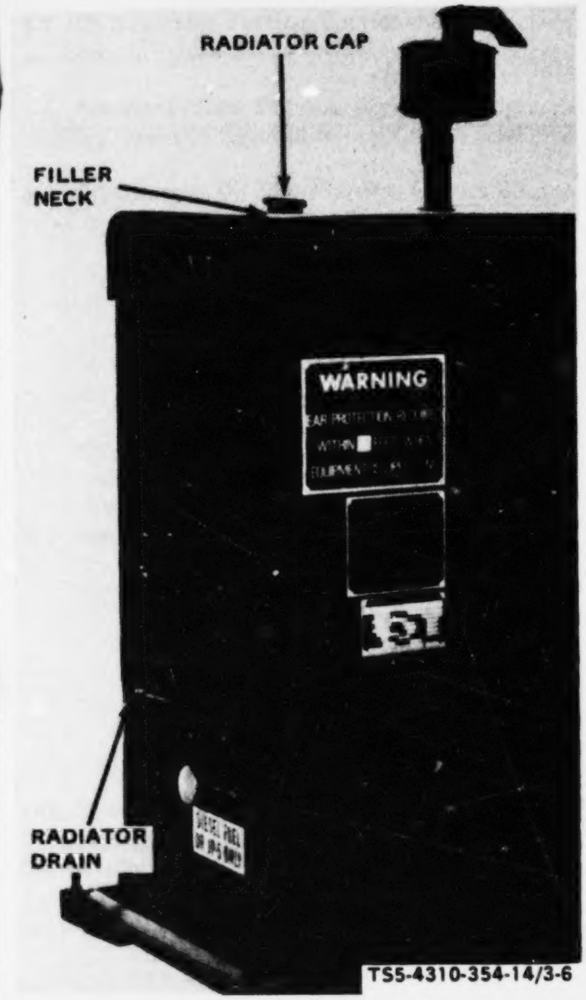
Item No.	Interval			Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available if:
	B	D	A			
					d. Check air cleaner indicators for red warning indication. Empty air cleaner dust compartments.	
					e. Check for loose, missing, or damaged parts.	
2.	●			Radiator	Check coolant level. Proper level is 2 inches below filler neck.	
3.	●			Control Panel Lamp	Check operation of instrument panel lamp. Replace if defective.	
4.		●		Control and Instruments	Check for damaged control cables and gauges.	
					Monitor gauges for normal indication. Normal indications are:	
				a. Engine Water Temperature	160 to 190°F.	
				b. Engine Oil Pressure	15 to 25 PSI idle, 40 to 60 PSI full load.	Oil pressure is below 10 psi.
				c. Fuel Pressure Gauge	3 to 5 PSI.	
				d. Compressor Oil Temperature	170 to 220°F.	
				e. Tachometer-Hourmeter	1100 rpm idle, 2200 rpm full load.	
5.		●		Safety Relief Valve	Check operation by lifting lever until air escapes.	Valve fails to reset or is leaking air.

Table 3-1. Operator/Crew Preventive Maintenance Checks and Services (continued)

B-Before D-During A-After

Item No.	Interval			Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available if:
	B	D	A			
					WARNING Do not fill fuel tank while engine is running or hot.	
6.			●	Fuel Tank	Fill tank.	

3-4. Radiator Service. Service the radiator as shown in figure 3-6.


RADIATOR CAP
FILLER NECK
WARNING
RADIATOR DRAIN
TS5-4310-354-14/3-6

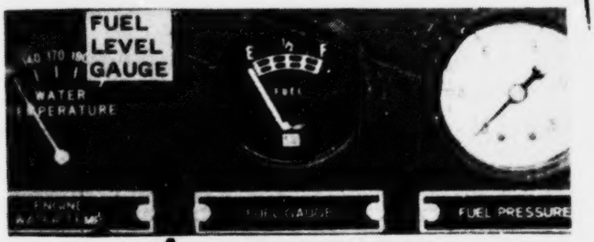
STEP 1. REMOVE RADIATOR CAP AND CHECK COOLANT LEVEL. PROPER LEVEL IS 2 INCHES (50.8 MM) BELOW FILLER NECK.

STEP 2. ADD COOLANT AS NECESSARY TO FILL RADIATOR TO PROPER LEVEL. INSTALL FILLER CAP.

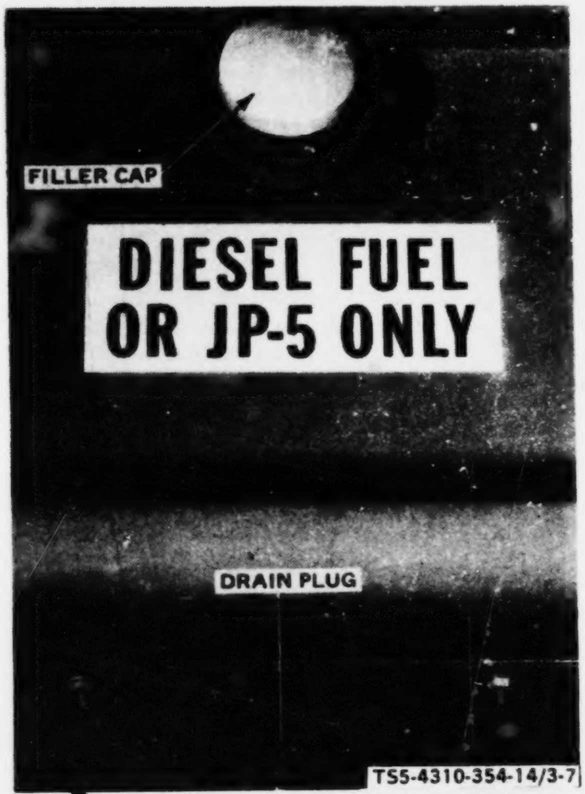
STEP 3. TO ADD ANTIFREEZE, REMOVE RADIATOR CAP. OPEN RADIATOR DRAIN AND DRAIN OFF COOLANT. DRAIN ONLY ENOUGH COOLANT TO ALLOW FOR QUANTITY OF ANTIFREEZE TO BE ADDED. REFER TO TABLE 2-1 FOR ANTIFREEZE MATERIALS. AFTER DRAIN-OFF, CLOSE DRAIN VALVE, ADD ANTIFREEZE; THEN, INSTALL RADIATOR CAP.

Figure 3-6. Radiator service.

3-5. Fuel Tank Service. Service the fuel tank as shown in figure 3-7.


FUEL LEVEL GAUGE
WATER TEMPERATURE
E ½ F
ENGINE WATER TEMP
FUEL GAUGE
FUEL PRESSURE

A INSTRUMENT PANEL


FILLER CAP
DIESEL FUEL OR JP-5 ONLY
DRAIN PLUG
TS5-4310-354-14/3-7

B FUEL TANK FILLER CAP AND DRAIN

STEP 1. CHECK FUEL LEVEL INDICATED ON INSTRUMENT PANEL FUEL LEVEL GAUGE.

STEP 2. REMOVE FUEL TANK FILLER CAP AND FILL TANK WITH PROPER GRADE OF DIESEL FUEL. REFER TO PARA 1-10.b. FOR TANK CAPACITY AND RECOMMENDED FUEL.

STEP 3. REMOVE FUEL TANK DRAIN PLUG TO DRAIN OFF FUEL FOR TANK SERVICE.

Figure 3-7. Fuel tank service.

3-6. Engine Crankcase Service. Service the engine crankcase as shown in figure 3-2.

3-7. Oil Separator Service. Service the oil separator as shown in figure 3-3.

3-8. Engine Oil Filter Service. Service the engine oil filter as shown in figure 3-4.

3-9. Compressor Oil Filter Service. Service the compressor oil filter as shown in figure 3-5.

WARNING

Provide adequate ventilation when using Methyl Ethyl Ketone (MEK). Avoid prolonged breathing of vapors and minimize skin contact.

CAUTION

Do not scrape or wire brush the element. Agitate and soak the element to clean. If element is coated with varnish (a heavy, sticky, brown substance), a prolonged soaking in MEK, or equivalent, will remove the varnish. A varnish condition is considered a malfunction. It is caused by use of improper oil, poor filter maintenance, operating above normal operating temperatures, or over extended oil change periods. Determine cause of the varnishing before continuing operation. If varnishing condition exists after next oil filter service period, the oil separator, oil cooler, and oil filter must be cleaned. Report this condition to organizational support.

3-10. Fuel Filter Service. Service the engine fuel filter as shown in figure 3-8.

NOTE

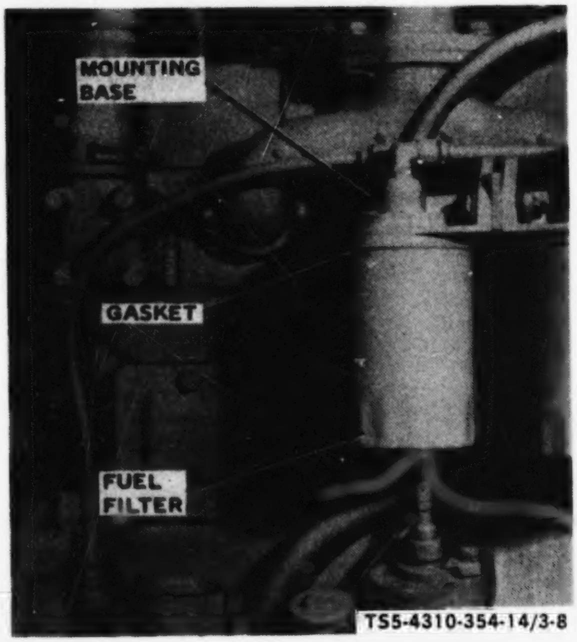
ENGINE FUEL FILTER IS THE SPIN-ON THROW-AWAY TYPE. REPLACE FUEL FILTER EVERY 100 HOURS OF OPERATION.

STEP 1. USE A STRAP WRENCH, OR EQUIVALENT, TO REMOVE FUEL FILTER. DISCARD FILTER AND GASKET.

STEP 2. WIPE UNDERSIDE OF MOUNTING BASE ASSEMBLY WITH A CLEAN LINT-FREE CLOTH MOISTENED WITH CLEAN DIESEL FUEL OR A SUITABLE SOLVENT.

STEP 3. INSTALL A NEW GASKET AND FUEL FILTER. USE STRAP WRENCH TO TIGHTEN FILTER. MAKE CERTAIN GASKET AND FILTER SEAT PROPERLY IN MOUNTING BASE ASSEMBLY. REFER TO FIG 3-17 AND PURGE AIR FROM SYSTEM.

STEP 4. AFTER ENGINE IS STARTED, CHECK THE FUEL FILTER FOR LEAKAGE AT MOUNTING BASE.



TS5-4310-354-14/3-8

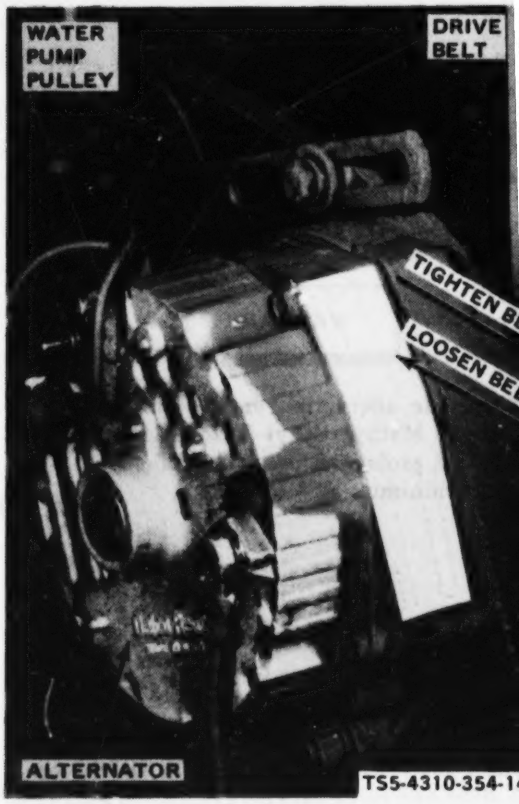
Figure 3-8. Fuel filter service.

3-11. Drive Belt Service. Service the drive belt as shown in figure 3-9.

STEP 1. CHECK DRIVE BELT FOR WEAR, FRAYING, AND CRACKING.

STEP 2. CHECK BELT TENSION. WHEN TENSION IS CORRECT, THE DRIVE BELT WILL DEFLECT APPROXIMATELY 3/4 INCH (19 MM) WITH THUMB PRESSURE APPLIED AT A POINT MIDWAY BETWEEN CRANKSHAFT PULLEY AND WATER PUMP PULLEY.

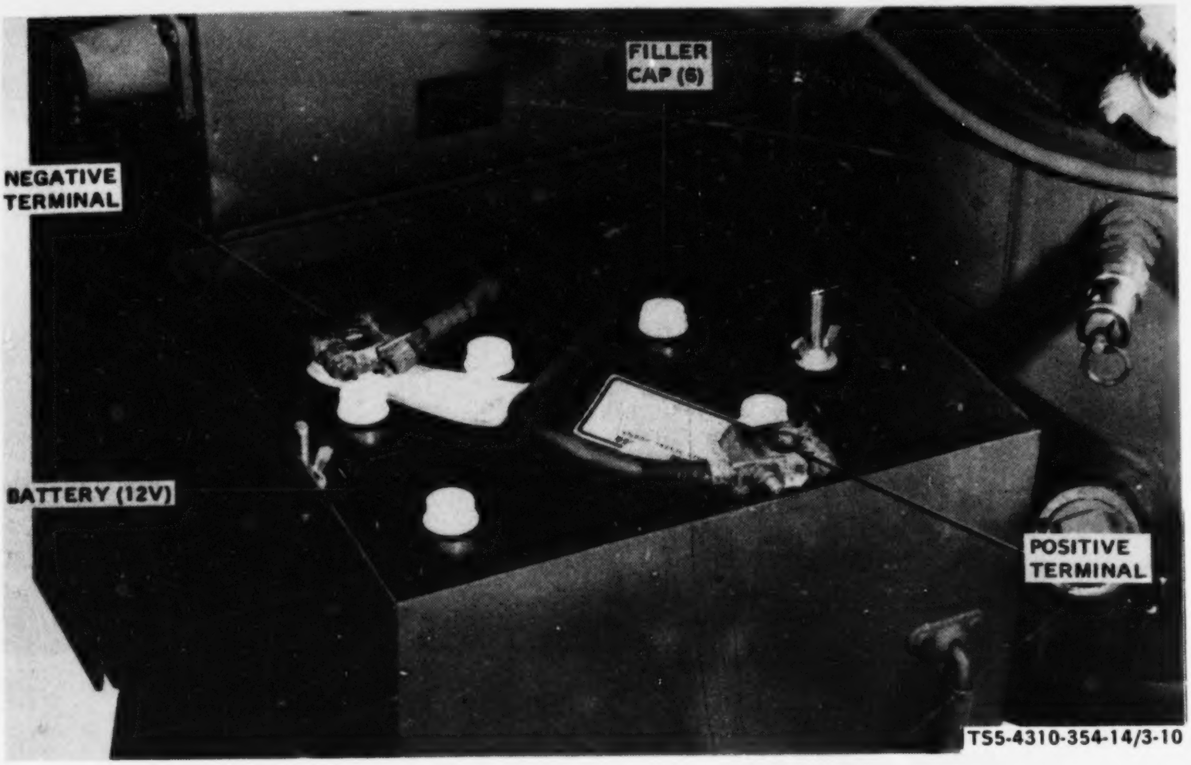
STEP 3. ADJUST TENSION BY MOVING ALTERNATOR CLOSER TO OR AWAY FROM THE ENGINE.


WATER PUMP PULLEY
DRIVE BELT
TIGHTEN B
LOOSEN BE
ALTERNATOR

TS5-4310-354-1

Figure 3-9. Drive belt service.

3-12. Battery Service. Service the battery as shown in figure 3-10.


FILLER CAP (6)
NEGATIVE TERMINAL
BATTERY (12V)
POSITIVE TERMINAL

TS5-4310-354-14/3-10

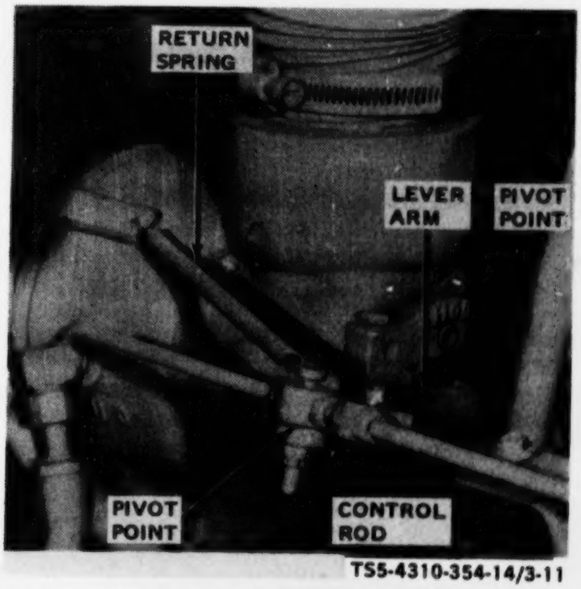
STEP 1. REMOVE CELL FILLER CAPS (6). CLEAN VENT HOLES IN CAPS AS NEEDED.

STEP 2. FILL BATTERY CELLS WITH DISTILLED WATER TO A LEVEL OF 3/8 INCH (9.5 MM) ABOVE PLATES. INSTALL CELL FILLER CAPS (6).

STEP 3. CLEAN TERMINALS (2) AND COAT LIGHTLY WITH LUBRICANT. CLEAN BATTERY WITH WATER OR SOLUTION OF SODIUM BICARBONATE. DO NOT ALLOW CLEANING SOLUTION TO ENTER CELLS. MAKE CERTAIN BATTERY TERMINAL CLAMPS ARE TIGHT. (UNIT IS NEGATIVE GROUND.)

Figure 3-10. Battery service.

3-13. Speed Control Linkage Service. Service the speed control linkage as shown in figure 3-11.


RETURN SPRING
LEVER ARM
PIVOT POINT
PIVOT POINT
CONTROL ROD

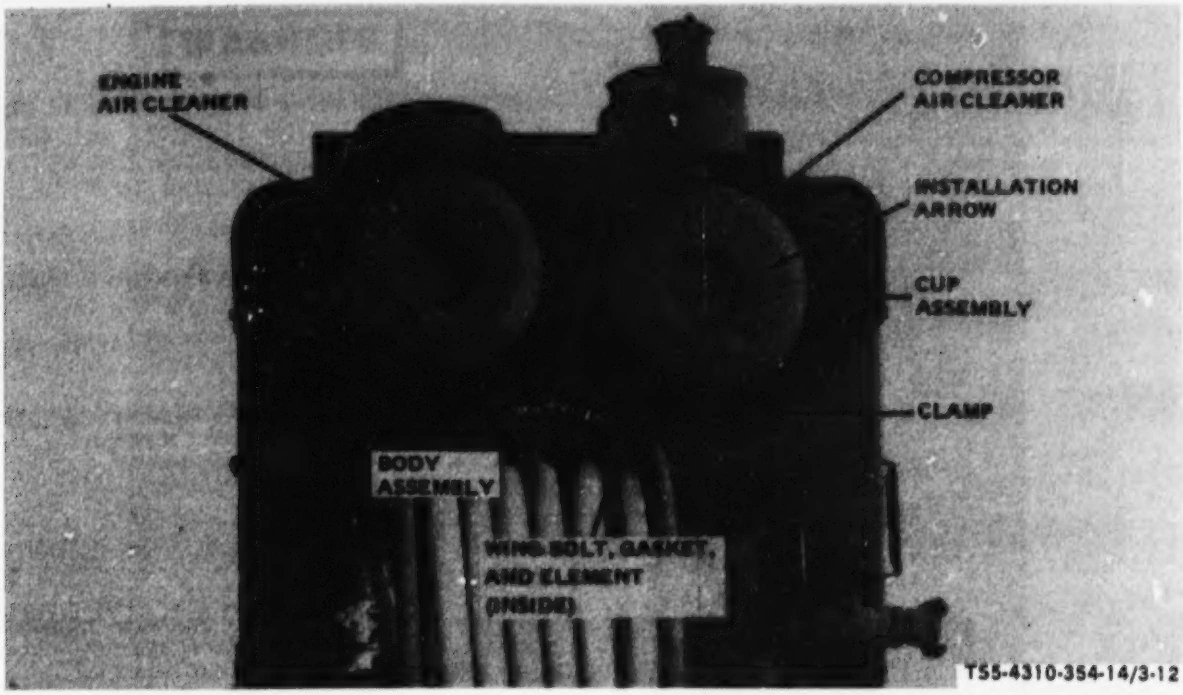
TS5-4310-354-14/3-11

STEP 1. USE A CLEANING SOLVENT CONFORMING TO FEDERAL SPECIFICATION P-D-680, TYPE II, OR EQUIVALENT. WIPE LEVER ARM, PIVOT POINTS, RETURN SPRING, AND CONTROL ROD CLEAN WITH SOLVENT.

STEP 2. LUBRICATE PIVOT POINTS AND SPRING. SEE LO5-4310-354-12, FIG 3-1.

Figure 3-11. Speed control linkage service.

3-14. Air Cleaner Service. Service the air cleaners, both engine and compressor, as shown in figure 3-12.



TS5-4310-354-14/3-12

NOTE

THE FOLLOWING SERVICE INSTRUCTIONS APPLY TO BOTH ENGINE AND COMPRESSOR AIR CLEANERS. DO NOT SERVICE AIR CLEANERS WHILE ENGINE IS OPERATING.

STEP 1. LOOSEN CLAMP THAT SECURES THE CUP ASSEMBLY TO THE BODY ASSEMBLY.

STEP 2. PULL CUP ASSEMBLY OUTWARD AND REMOVE FROM UNIT. REMOVE WING BOLT AND GASKET THAT SECURES ELEMENT IN BODY ASSEMBLY. REMOVE THE ELEMENT.

NOTE

DO NOT CLEAN INSIDE OF BODY ASSEMBLY WITH COMPRESSED AIR.

STEP 3. CLEAN THE INSIDE OF BODY ASSEMBLY WITH CLEAN, LINT-FREE CLOTH MOISTENED WITH SOLVENT, FED SPEC P-D-680, TYPE II, OR EQUIVALENT. WIPE DRY WITH CLEAN CLOTH.

STEP 4. CLEAN CUP ASSEMBLY WITH SOLVENT, FED SPEC P-D-680, TYPE II, OR EQUIVALENT, AND DRY THOROUGHLY.

STEP 5. REFER ELEMENT CLEANING TO ORGANIZATIONAL MAINTENANCE.

STEP 6. INSTALL CLEAN ELEMENT IN AIR CLEANER BODY ASSEMBLY. SECURE IN PLACE WITH GASKET AND WING BOLT.

STEP 7. INSTALL CUP ASSEMBLY AND SECURE TO BODY ASSEMBLY WITH CLAMP.

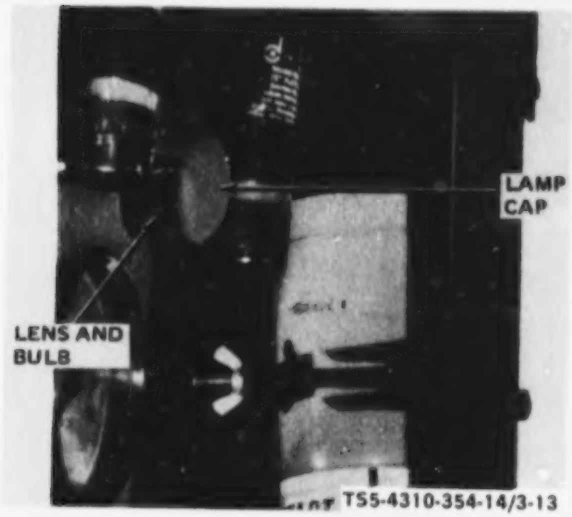
NOTE

INSTALL CUP ASSEMBLY WITH ARROWS POINTING UPWARD.

STEP 8. RESET RESTRICTION INDICATORS ON INSTRUMENT PANEL BY PRESSING DOWN ON INDICATOR TOP RESET UNTIL INDICATOR WINDOW SHOWS GREEN. (FIG 2-3.)

Figure 3-12. Air cleaner service.

3-15. Instrument Panel Lamp Service. Service the instrument panel lamp as shown in figure 3-13.


LAMP CAP
LENS AND BULB
TS5-4310-354-14/3-13

STEP 1. TURN PANEL LAMP CAP COUNTERCLOCKWISE AND REMOVE CAP.

STEP 2. REPLACE BULB AND INSTALL PANEL LAMP CAP.

Figure 3-13. Instrument panel lamp service.

3-16. Quick Start Assembly Service. Service the quick start assembly as shown in figure 3-14.

WARNING

DO NOT PUNCTURE OR MISHANDLE FUEL CYLINDER. THE CONTENTS OF THE CYLINDER IS AN ETHER BASE MIXTURE WHICH IS EXTREMELY TOXIC, VOLATILE, AND COMBUSTIBLE.

STEP 1. REMOVE WINGNUTS, LOCKWASHERS, AND CLAMP.

STEP 2. UNSCREW AND REMOVE FUEL CYLINDER FROM ACTUATING VALVE ASSEMBLY. COVER VALVE OPENING WITH CAP UNTIL READY TO INSTALL NEW FUEL CYLINDER.

STEP 3. REMOVE VALVE CAP AND INSTALL NEW GASKET AND NEW CYLINDER. TIGHTEN CYLINDER IN VALVE HAND TIGHT ONLY. DO NOT OVER TIGHTEN.

STEP 4. INSTALL CLAMP, LOCKWASHERS, AND WINGNUTS.

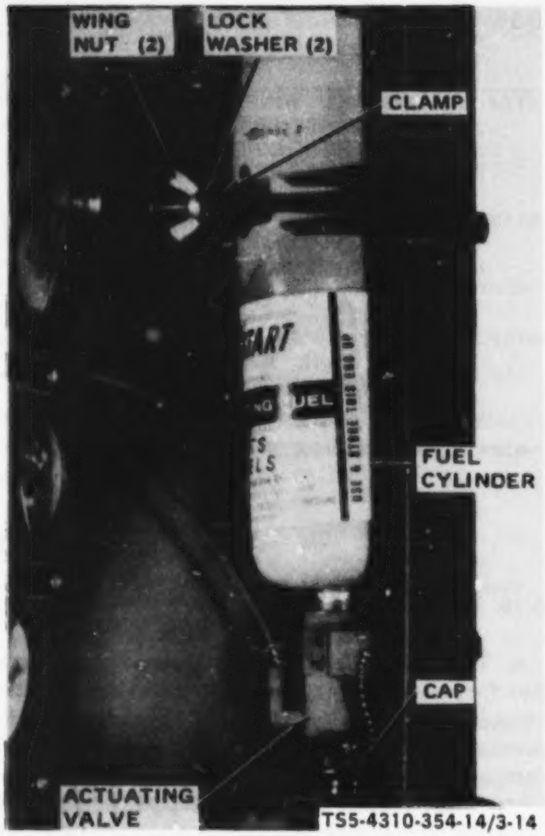
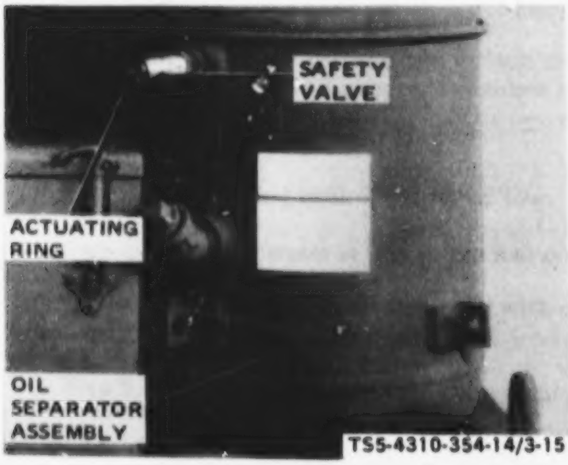

WING NUT (2)
LOCK WASHER (2)
CLAMP
FUEL CYLINDER
CAP
ACTUATING VALVE
TS5-4310-354-14/3-14

Figure 3-14. Quick start assembly service.

3-17. Safety Valve Service. Service the oil separator safety valve as shown in figure 3-15.


SAFETY VALVE
ACTUATING RING
OIL SEPARATOR ASSEMBLY
TS5-4310-354-14/3-15

STEP 1. CHECK OPERATION OF SAFETY VALVE WHILE UNIT IS RUNNING. PULL ACTUATING RING OUTWARD MOMENTARILY AND RELEASE. VALVE SHOULD CLOSE COMPLETELY.

STEP 2. IN AN EMERGENCY, THE SAFETY VALVE MAY BE USED TO RELIEVE PRESSURE IN OIL SEPARATOR SHOULD THE BLOWDOWN VALVE FAIL.

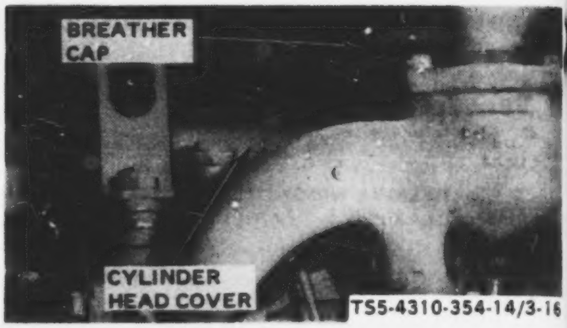
Figure 3-15. Safety valve service.

3-18. Engine Crankcase Breather Service. Service the engine crankcase breather as shown in figure 3-16.

STEP 1. UNSCREW WING BOLT AND REMOVE CRANKCASE BREATHER CAP FROM CYLINDER HEAD COVER. INSPECT AND CLEAN EACH TIME THE OIL IS CHANGED.

STEP 2. CLEAN THE BREATHER WITH FRESH, CLEAN FUEL OIL OR SOLVENT, FED SPEC P-D-680, TYPE II, OR EQUIVALENT. BLOW DRY WITH COMPRESSED AIR.

STEP 3. APPLY A SMALL AMOUNT OF CLEAN ENGINE OIL TO THE BREATHER CAP SCREENS. INSTALL THE BREATHER CAP ON CYLINDER HEAD COVER.



TS5-4310-354-14/3-1

Figure 3-16. Engine crankcase breather service.

Section III. TROUBLESHOOTING

3-19. Introduction.

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the rotary air compressor unit. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you to determine probable causes and corrective actions to take. You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and correctiv actions. If a malfunction is not listed or is no corrected by listed corrective actions, notify you supervisor.

NOTE

Before you use this table, be sure you have performed all applicable operating checks.

3-20. Troubleshooting. Refer to table 3-2.

Table 3-2. Operator/Crew Troubleshooting

ALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE

ENGINE FAILS TO CRANK WHEN STARTER BUTTON IS DEPRESSED.

Step 1. Check to see if battery electrolyte level is above the top of the plates.

If electrolyte level is below the top of the plates, add distilled or clean water to the cells until the electrolyte level is ⅜ inch (9.5 mm) above the plates. Recharge battery.

Step 2. Inspect for loose, corroded, or broken battery cables.

Clean corroded cables and battery terminals. Tighten loose connections at battery terminals, ground, and starter. If cables are broken, notify organizational maintenance.

Step 3. Starter switch wires on instrument panel loose or broken.

If starter switch wires are loose, tighten the terminal connections. If wires are broken, notify organizational maintenance.

Step 4. Any other cause.

Notify organizational maintenance if engine will still not crank after performing steps 1 through 3.

ENGINE CRANKS BUT FAILS TO START WHEN STARTER BUTTON IS DEPRESSED.

Step 1. Check ignition switch. It must be in ON position.

Pull ignition switch outward to ON position.

Step 2. Safety pushbutton switch is not being pressed along with starter button.

Press safety pushbutton switch simultaneously with starter pushbutton and hold in until engine oil pressure reaches at least 4 psi (0.28 KG/CM^2).

Step 3. Check for empty fuel tank.

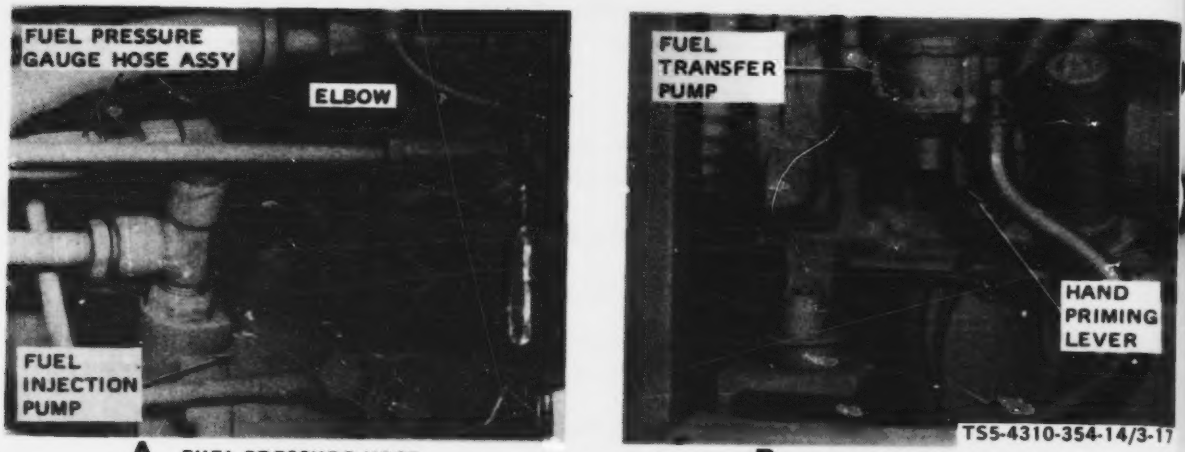
Fill the fuel tank if empty or low.

Step 4. Check for water or dirt in the fuel system.

Drain the fuel tank and refill with clean fuel. Replace the engine fuel filter. Purge fuel system of air (figure 3-17).

Step 5. Check for air in fuel injection system.

Disconnect fuel pressure gauge hose from elbow at fuel injection pump inlet and purge the system of air (figure 3-17). Manually operate the fuel transfer pump lever until air-free fuel flows from the hose connection elbow; then reconnect the hose.


FUEL PRESSURE GAUGE HOSE ASSY
ELBOW
FUEL INJECTION PUMP
FUEL TRANSFER PUMP
HAND PRIMING LEVER
TS5-4310-354-14/3-17

A FUEL PRESSURE HOSE

B FUEL TRANSFER PUMP

NOTE

PURGING OF AIR FROM FUEL SYSTEM MUST BE DONE WITH ENGINE STOPPED. MAKE CERTAIN IGNITION SWITCH IS OFF.

STEP 1. DISCONNECT FUEL PRESSURE GAUGE HOSE ASSY AT ELBOW ON FUEL INJECTION PUMP.

STEP 2. ACTUATE THE HAND PRIMING LEVER ON THE FUEL TRANSFER PUMP UNTIL AIR-FREE FUEL FLOWS FROM THE ELBOW.

STEP 3. CONNECT FUEL PRESSURE GAUGE HOSE TO ELBOW AND CLEAN AREA OF SPILLED FUEL.

Figure 3-17. Purging fuel system of air.

Table 3-2. Operator/Crew Troubleshooting — Continued

UNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — Continued

GINE CRANKS BUT FAILS TO START WHEN STARTER BUTTON IS DEPRESSED — tinued.

Step 6. Check and make certain proper grade of fuel is being used.

Drain fuel tank and refill with proper grade of fuel.

Step 7. Check air cleaner restriction indicator on instrument panel for indication of air cleaner element being restricted.

Remove the air cleaner element and notify organizational maintenance that element requires cleaning.

Step 8. Any other cause.

Notify organizational maintenance.

GINE MISSES OR RUNS ERRATICALLY.

Step 1. Check temperature of engine coolant.

Allow engine to run until operating temperature is achieved before applying air compressor load. Warm-up engine at fast idle.

Step 2. Check for water or dirt in the fuel system.

Drain the fuel tank and refill with clean fuel.

Replace the engine fuel filter.

Step 3. Check for air in the fuel injection system.

Disconnect fuel pressure gauge hose from elbow at fuel injection pump inlet and purge the system of air (figure 3-17). Manually operate the fuel transfer pump lever until air-free fuel flows from the hose connection elbow; then reconnect the hose.

Step 4. Check for restriction in engine exhaust.

Remove any exhaust restriction.

Step 5. Any other cause.

Notify organizational maintenance.

INE LACKS POWER.

tep 1. Check air cleaner restriction indicator on instrument panel.

If indicator shows red, remove air cleaner element, notify organizational maintenance that air cleaner element requires cleaning, install clean air cleaner element. Press top of restriction indicator to reset to green.

Table 3-2. Operator/Crew Troubleshooting — Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

4. ENGINE LACKS POWER — continued.

Step 2. Check for restriction in engine exhaust.

Remove any exhaust restriction.

Step 3. Check fuel filter replacement interval.

Replace fuel filter at proper interval.

Step 4. Check for contaminated fuel or improper fuel grade.

Drain fuel tank and refill with clean fuel of proper grade.

Step 5. Check for air in fuel injection system.

Purge air from fuel injection system (figure 3-17).

Step 6. Any other causes for lack of power.

Notify organizational maintenance.

5. ENGINE KNOCKS, DEVELOPS EXCESSIVE NOISE, OR VIBRATES.

Step 1. Check engine oil level.

Fill crankcase to full mark on dipstick. Refer to LO 5-4310-354-12, figure 3-1.

Step 2. Check to see if proper grade of fuel is being used or if fuel is contaminated.

If fuel grade is not correct, or contaminated, drain fuel tank, refill with proper grade, change fuel filter, and purge system of air.

Step 3. Engine overloaded or speed is too high.

Notify organizational maintenance for speed control adjustment.

Step 4. Check to see if engine is overheated.

If engine is overheated, add coolant to radiator as necessary. If coolant is not low, the thermostat may be defective. Notify organizational maintenance.

Step 5. Check for other causes.

Notify organizational maintenance.

Table 3-2. Operator/Crew Troubleshooting — Continued

FUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

GINE HAS LOW OIL PRESSURE.

Step 1. Check engine oil level.

Fill crankcase to full mark on dipstick. Refer to LO 5-4310-354-12, figure 3-1.

Step 2. Check to see if correct grade of engine oil is being used or if oil is contaminated.

If incorrect grade was used, or if oil is contaminated, drain oil from engine crankcase and refill with correct oil. Replace engine oil filter. Clean crankcase breather. Refer to LO 5-4310-354-12, figure 3-1.

Step 3. Check for other causes for low oil pressure.

Notify organizational maintenance.

GINE IS OVERHEATING.

Step 1. Check the level of coolant in radiator.

Fill radiator with coolant to a level approximately 2 inches (50.8 mm) below radiator filler neck.

Step 2. Check the tension of fan drive belt.

Adjust the tension of the belt by moving alternator away from the engine to tighten belt.

Step 3. Check the engine crankcase oil level.

Fill crankcase to full mark on dipstick. Refer to LO 5-4310-354-12, figure 3-1.

Step 4. Inspect the radiator grill and external surface of the radiator core for obstructions, such as dirt, paper, and the like.

Remove any obstructions and blow off dirt with compressed air.

Step 5. Inspect for any obstruction in engine exhaust.

Remove the obstruction.

Step 6. Inspect for any other cause for overheating.

Notify organizational maintenance.

INE HAS LOW FUEL PRESSURE.

Step 1. Check level of fuel in fuel tank.

Refill fuel tank with proper grade of fuel.

Table 3-2. Operator/Crew Troubleshooting — Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

8. ENGINE HAS LOW FUEL PRESSURE — continued.

Step 2. Check fuel pressure hose connections for leaking.

Tighten the connections at fuel pressure gauge and at fuel injection pump.

Step 3. Inspect fuel pressure gauge for proper operation.

Notify organizational maintenance for gauge replacement.

Step 4. Check fuel injection pump operation.

Purge the fuel system of air (figure 3-17). If system is not air-bound, notify Direct o General Support maintenance.

Step 5. Inspect for a dirty, clogged fuel filter.

Replace dirty fuel filter.

Step 6. Check for any other cause.

Notify organizational maintenance.

9. ENGINE EXHAUST EXCESSIVELY BLACK.

Step 1. Check air cleaner restriction indicator on instrument panel for red color indicating a restricte flow of air to engine.

Remove the air cleaner element for organizational maintenance cleaning. Install clean air cleaner element and reset restriction indicator to green by pressing down o top of the indicator.

Step 2. Check for restriction in engine exhaust.

Remove any exhaust obstruction.

Step 3. Check for the use of proper grade of fuel.

If fuel grade is not correct, drain fuel tank, refill with proper grade, and purge the fue system of air.

Step 4. Check engine operating temperature for overheating.

If engine coolant and oil level is not low causing engine to overheat, notify organizational maintenance.

Step 5. Check for any other cause.

Notify organizational maintenance.

Table 3-2. Operator/Crew Troubleshooting — Continued

FUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

NGINE EXHAUST EXCESSIVELY BLUE OR WHITE.

Step 1. Check for oil level being above the full mark on dipstick.

Drain excess oil from crankcase. Check for evidence of water in drained oil. Notify organizational maintenance if any is found.

Step 2. Check grade of fuel being used and for contaminated fuel.

Drain fuel tank and refill with clean fuel of proper grade.

Step 3. Check to make certain correct grade of lubricating oil is used for operating temperatures.

Change oil using proper grade. Refer to LO 5-4310-354-12, figure 3-1.

Step 4. Check for a dirty, clogged fuel filter.

Replace a dirty fuel filter.

Step 5. Check for any other cause.

Notify organizational maintenance.

XCESSIVE OIL CONSUMPTION.

Step 1. Check for use of proper grade of oil for operating temperature conditions.

Change lubricating oil to correct grade for the conditions. Refer to LO 5-4310-354-12, figure 3-1.

Step 2. Inspect the engine for evidence of oil leakage.

Tighten bolts and nuts as necessary. If leakage does not stop, notify Direct Support or General Support maintenance.

Step 3. Check for any other cause.

Notify organizational maintenance.

XCESSIVE FUEL CONSUMPTION.

Step 1. Check fuel line connections at fuel tank, fuel transfer pump, fuel filter, and fuel injection pump. Check both fuel pickup and return lines.

Tighten any loose connections. If fuel lines are damaged, notify organizational maintenance.

Step 2. Inspect fuel tank for evidence of leakage.

Notify organizational maintenance.

Table 3-2. Operator/Crew Troubleshooting — Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

12. EXCESSIVE FUEL CONSUMPTION — continued.

Step 3. Inspect the unit for any other evidence of fuel leakage.

Notify organizational maintenance.

13. ENGINE STALLS AT LOW SPEED.

Step 1. Check for air in the fuel system.

Tighten any loose fuel line connections and purge fuel system of air (figure 3-17).

Step 2. Check for dirty, clogged fuel filter.

Replace a dirty fuel filter.

Step 3. Check fuel supply.

Refill the fuel tank when low on fuel.

Step 4. Check engine idle speed on tachometer-hourmeter.

Notify organizational maintenance if speed is below 1000 rpm.

Step 5. Check for other causes.

Notify organizational maintenance.

14. ENGINE FAILS TO STOP.

Step 1. Check wiring between ignition switch on the instrument panel and fuel injection pump solenoi terminals and check the ignition switch.

The fuel injection pump solenoid is of the energize-to-run type. To manually sto engine, disconnect wires from fuel injection pump solenoid terminals. Notify organizational maintenance of this malfunction. The malfunction is likely to be a faulty ignitio switch that does not interrupt the circuit. Another method to manually stop the engin is to disconnect the fuel pickup line at the fuel transfer pump.

Step 2. Check for any other causes.

Notify organizational maintenance.

15. ENGINE STOPS SUDDENLY.

Step 1. Check fuel supply.

Refill the fuel tank and purge the system of air (figure 3-17).

Table 3-2. Operator/Crew Troubleshooting — Continued

FUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

NGINE STOPS SUDDENLY — continued.

Step 2. Check for dirty, clogged fuel filter.

Replace a dirty fuel filter.

Step 3. Check for water or other contaminants in the fuel.

Drain the fuel tank and refill with clean fuel of proper grade. Replace fuel filter and purge system of air (figure 3-17).

Step 4. Check for engine overheating (safety switch shutdown).

Fill radiator with coolant as needed. Add oil to engine crankcase as needed. Adjust fan drive belt as necessary. Examine radiator hoses for leakage and notify organizational maintenance if hoses require replacement. Allow engine to cool before restarting. No reset, other than allowing to cool, is necessary for this safety shutdown.

Step 5. Check for low engine oil pressure (safety switch shutdown).

Add oil to crankcase to the full mark on the dipstick. Refer to LO 5-4310-354-12, figure 3-1. No reset is required for this safety shutdown other than replenishment of oil.

Step 6. Check for air compressor overheating (safety switch shutdown).

Add oil to separator tank as necessary. Refer to LO 5-4310-354-12, figure 3-1. Inspect compressor oil lines, to and from the oil cooler, and the oil cooler for evidence of leakage. Notify organizational maintenance of leakage. No reset is required other than allowing unit to cool after replenishing oil supply.

Step 7. Check for engine overspeed trip (safety shutdown switch).

Notify organizational maintenance for an overspeed malfunction. Cause for the overspeed must be determined, speed control linkage adjusted, and overspeed switch must be reset.

Step 8. Check for other causes of engine stopping suddenly.

Notify organizational maintenance.

AIR COMPRESSOR

IR COMPRESSOR IS OVERHEATING.

Step 1. Check for proper level of oil in oil separator tank.

Add oil as necessary. Proper level is to overflow at filler elbow. Refer to LO 5-4310-354-12, figure 3-1.

Table 3-2. Operator/Crew Troubleshooting — Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

AIR COMPRESSOR — continued

16. AIR COMPRESSOR IS OVERHEATING — continued.

Step 2. Check compressor oil filter for dirty element.

Clean the oil filter element.

Step 3. Inspect compressor oil lines, both to and from oil cooler, for evidence of leaking. Inspect external surface of oil cooler core for accumulated dirt, dust, or obstructions.

Remove any obstructions and blow accumulated dirt off oil cooler core with compressed air. Notify organizational maintenance of any leakage.

Step 4. Inspect for any other causes for overheating.

Notify organizational maintenance.

17. COMPRESSOR IS NOISY.

Step 1. Check level of oil in oil separator tank.

Fill tank to proper level of overflow from filler elbow. Refer to LO 5-4310-354-12, figure 3-1.

Step 2. Inspect for any other cause.

Notify organizational maintenance.

18. COMPRESSOR NOT OPERATING TO FULL CAPACITY OR PRESSURE.

Step 1. Check air cleaner restriction indicator on instrument panel for red showing in the indicator window.

Remove air cleaner element and notify organizational maintenance that element requires cleaning. Install clean element and press the top of indicator to reset to green in indicator window.

Step 2. Check unloader control cable handle on the instrument panel. The handle must be all the way in, and locked, to fully open intake valve plate on compressor.

Unlock unloader control handle by turning counterclockwise. Push handle all the way in and turn handle clockwise to lock.

Step 3. Check for other causes.

Notify organizational maintenance.

Table 3-2. Operator/Crew Troubleshooting — Continued

LFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

AIR COMPRESSOR — continued

EXCESSIVE COMPRESSOR OIL CONSUMPTION.

Step 1. Inspect the compressor oil line connections at compressor discharge, separator inlet, oil filter/thermal bypass inlet and outlet, oil cooler inlet and outlet, and the oil cooler for leaks.

Tighten hose clamps, loose oil line fittings, and notify organizational maintenance of damaged oil lines or leaking oil cooler.

Step 2. Inspect for any other cause for excessive compressor oil consumption.

Notify organizational maintenance.

. CONDENSATE AND/OR EMULSION IN OIL SEPARATOR.

Step 1. Check compressor oil temperature. The operating temperature must be at least 150°F (66°C).

Unusually low oil temperature and high humidity can cause this condition. If operating in a cold climate, change to proper grade of oil. Refer to LO 5-4310-354-12, figure 3-1.

Step 2. Check for other causes.

Notify Direct Support or General Support maintenance.

Section IV. MAINTENANCE PROCEDURES

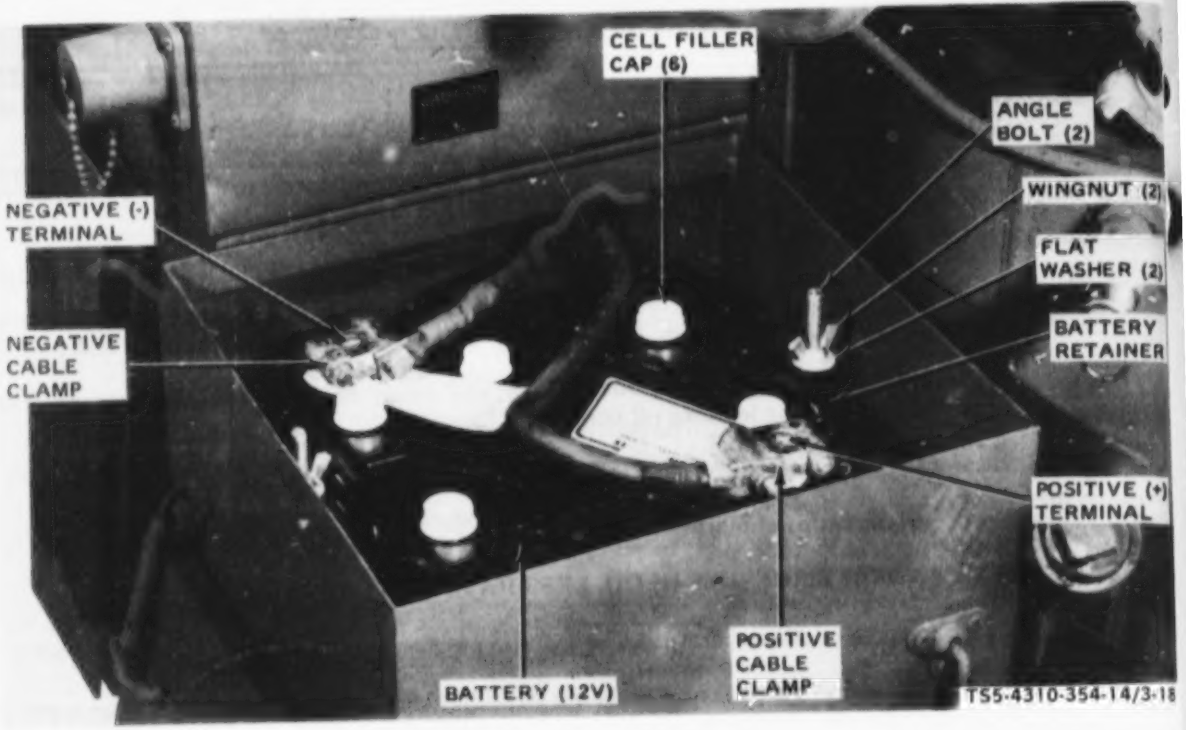
1. General. This section contains instructions
vering those maintenance functions which the
erator/crew can perform. Those maintenance func-
ns for which the operator/crew is required to assist
ganizational maintenance personnel will be found
Chapter 4.

2. Storage Battery.

a. Inspection. Remove the battery box cover and inspect the storage battery as shown in figure 3-18.

b. Cleaning. Clean the storage battery terminals as shown in figure 3-18.

c. Filling. Fill the storage battery as specified in figure 3-18.


CELL FILLER CAP (6)
ANGLE BOLT (2)
WINGNUT (2)
FLAT WASHER (2)
BATTERY RETAINER
NEGATIVE (-) TERMINAL
NEGATIVE CABLE CLAMP
POSITIVE (+) TERMINAL
POSITIVE CABLE CLAMP
BATTERY (12V)
TS5-4310-354-14/3-18

INSPECTION:

WARNING

DO NOT ALLOW BATTERY ELECTROLYTE TO COME IN CONTACT WITH CLOTHING, SKIN, OR EYES. USE RUBBER GLOVES AND PROTECTIVE CLOTHING.

STEP 1. INSPECT BATTERY FOR GENERAL CONDITION SUCH AS EVIDENCE OF CRACKS IN CASE, BROKEN TERMINALS, AND PLUGGED OR MISSING CELL FILLER CAPS.

STEP 2. INSPECT CABLE CLAMPS AND BATTERY TERMINALS FOR CORROSION.

STEP 3. CHECK CABLE CLAMPS FOR TIGHT CONNECTION ON TERMINALS.

STEP 4. CHECK BATTERY MOUNTING. BATTERY RETAINER SHOULD BE POSITIONED ON BATTERY EDGES. WINGNUTS WILL BE TIGHT, SECURING RETAINER AND BATTERY IN BOX, TO PREVENT MOVEMENT OF BATTERY WHEN UNIT IS TRANSPORTED.

CLEANING:

STEP 1. CLEAN BATTERY, TERMINALS, AND CABLE CLAMPS WITH WATER OR A SOLUTION OF SODIUM BICARBONATE. DO NOT ALLOW THIS SOLUTION TO ENTER CELLS OR MIX WITH THE ELECTROLYTE. MAKE CERTAIN CELL FILLER CAP VENT HOLES ARE NOT PLUGGED.

STEP 2. LUBRICATE THE CLEAN TERMINALS AND CABLE CLAMPS IN ACCORDANCE WITH LO5-4310-354-12, FIG 3-1. MAKE CERTAIN CABLE CLAMPS ARE TIGHT ON TERMINALS.

FILLING:

STEP 1. REMOVE THE CELL FILLER CAPS (6). AGAIN, MAKE CERTAIN VENT HOLES IN CAPS ARE NOT PLUGGED.

STEP 2. FILL CELLS WITH DISTILLED WATER, AS NECESSARY, TO A LEVEL 3/8 INCH (9.5 MM) ABOVE PLATES. INSTALL FILLER CAPS.

STEP 3. START THE ENGINE (PARA 2-2) AND ALLOW TO RUN FOR APPROXIMATELY ONE HOUR AFTER FILLING BATTERY.

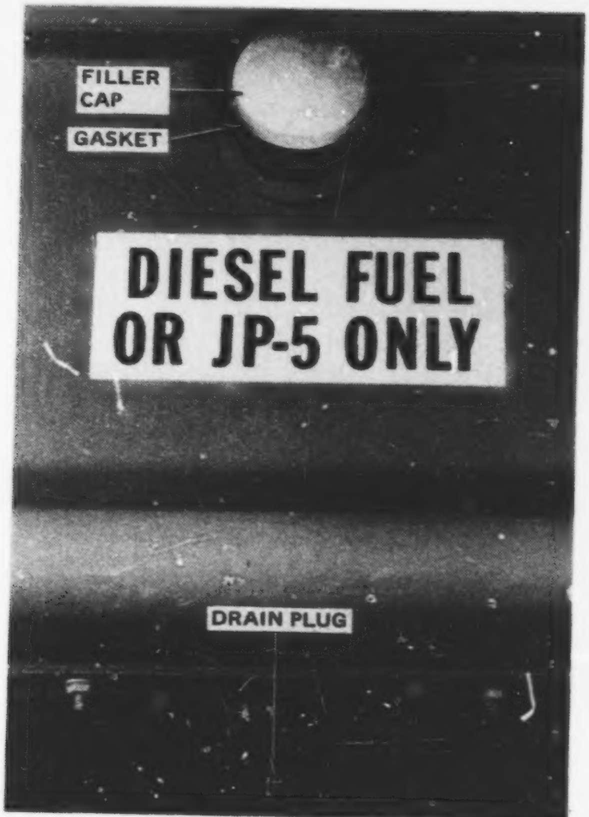
Figure 3-18. Storage battery, inspection and filling.

-23. Fuel Tank and Fuel Filter.

a. Filling Fuel Tank. Fill the fuel tank as shown in gure 3-19.

b. Draining Fuel Tank. Drain contaminated fuel from fuel tank as shown in figure 3-19.

c. Fuel Filter Replacement. Replace the throw-away, spin-on type fuel filter as shown in figure 3-19.



A FUEL TANK

FILLING:

STEP 1. REMOVE FUEL TANK FILLER CAP. INSPECT CAP GASKET FOR DAMAGE AND VENT HOLE FOR PLUGGING.

STEP 2. FILL FUEL TANK WITH PROPER GRADE OF DIESEL FUEL. INSTALL FILLER CAP.

NOTE

TO OPERATE FUEL LEVEL GAUGE (FIG 2-3) WHEN ENGINE IS NOT RUNNING, PULL IGNITION SWITCH ON AND PRESS THE SAFETY PUSHBUTTON SWITCH. AFTER TANK IS FILLED, PUSH IGNITION SWITCH TO OFF POSITION.

DRAINING:

STEP 1. REMOVE FUEL TANK FILLER CAP.

STEP 2. REMOVE PIPE PLUG FROM BOTTOM OF FUEL TANK AND DRAIN CONTAMINATED FUEL. INSTALL DRAIN PLUG.

MOUNTING BASE ASSEMBLY
GASKET
FUEL FILTER
TS5-4310-354-14/3-19

B FUEL FILTER

STEP 3. REFILL FUEL TANK WITH CLEAN FUEL AS INSTRUCTED ABOVE.

NOTE

AFTER DRAINING CONTAMINATED FUEL FROM TANK AND REFILLING, REPLACE FUEL FILTER

FUEL FILTER REPLACEMENT:

STEP 1. USE A STRAP WRENCH, OR EQUIVALENT, AND UNSCREW FUEL FILTER FROM MOUNTING BASE ASSEMBLY. REMOVE FILTER GASKET IF IT HAS STUCK TO BASE ASSEMBLY.

STEP 2. CLEAN UNDERSIDE OF BASE ASSEMBLY OF ALL GASKET MATERIAL. WIPE BASE ASSEMBLY WITH A CLEAN, LINT-FREE CLOTH MOISTENED WITH CLEAN DIESEL FUEL OR SOLVENT, FED SPEC P-D-680, TYPE II, OR EQUIVALENT.

STEP 3. DISCARD FUEL FILTER JUST REMOVED AND INSTALL A NEW GASKET AND NEW FUEL FILTER. USE STRAP WRENCH, OR EQUIVALENT, TO TIGHTEN FUEL FILTER. MAKE CERTAIN FILTER IS POSITIONED PROPERLY AGAINST BASE ASSEMBLY TO PREVENT LEAKAGE.

NOTE

THE FUEL FILTER IS OF THE THROW-AWAY, SPIN-ON TYPE. THIS TYPE OF FILTER IS NOT CLEANABLE. IT WILL BE DISCARDED AND REPLACED BY A NEW FILTER WHEN REMOVED AT REGULAR CHANGE INTERVAL AND WHEN CONTAMINATED FUEL IS REPLACED. AFTER INSTALLING NEW FILTER, PURGE AIR FROM FUEL SYSTEM (FIG 3-17). AFTER ENGINE IS STARTED, CHECK FOR FUEL LEAKS.

Figure 3-19. Fuel tank filling, draining, and fuel filter replacement.

3-24. Engine Oil Filter.

a. Removal. Remove the engine oil filter as shown in figure 3-20.

b. Installation. Install the engine oil filter as shown in figure 3-20.

REMOVAL:

STEP 1. USE A STRAP WRENCH, OR EQUIVALENT, AND UNSCREW OIL FILTER FROM MOUNTING BASE ASSEMBLY. REMOVE FILTER GASKET IF IT HAS STUCK TO BASE ASSEMBLY.

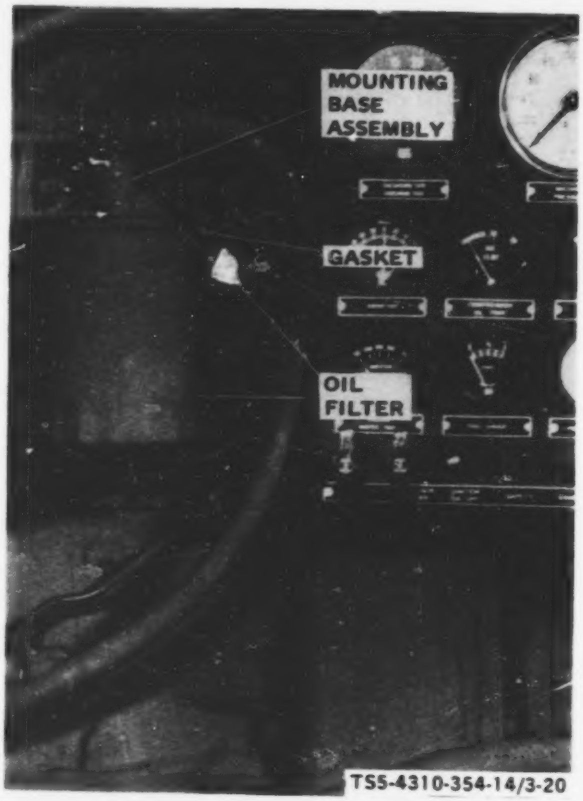
STEP 2. CLEAN UNDERSIDE OF BASE ASSEMBLY OF ALL GASKET MATERIAL. WIPE BASE ASSEMBLY WITH A CLEAN, LINT-FREE CLOTH MOISTENED WITH CLEAN DIESEL FUEL OR SOLVENT, FED SPEC P-D-680, TYPE II, OR EQUIVALENT.

INSTALLATION:

STEP 3. DISCARD OIL FILTER JUST REMOVED AND INSTALL A NEW GASKET AND NEW OIL FILTER. USE STRAP WRENCH, OR EQUIVALENT, TO TIGHTEN OIL FILTER. MAKE CERTAIN FILTER IS POSITIONED PROPERLY AGAINST BASE ASSEMBLY TO PREVENT LEAKAGE.

NOTE

THE OIL FILTER IS OF THE THROW-AWAY, SPIN-ON TYPE. THIS TYPE OF FILTER IS NOT CLEANABLE. IT WILL BE DISCARDED AND REPLACED BY A NEW FILTER. REFER TO LO5-4310-354-12, FIG 3-1.
AFTER ENGINE IS STARTED, CHECK FOR OIL LEAKS.



TS5-4310-354-14/3-20

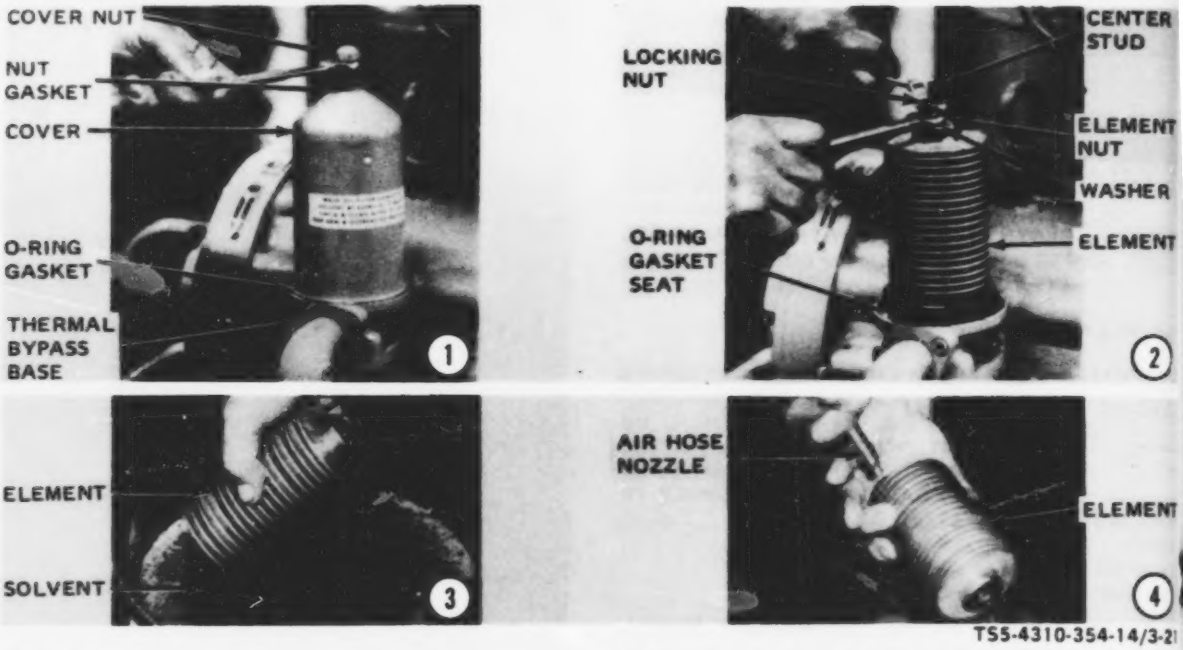
Figure 3-20. Engine oil filter, removal and installation.

3-25. Compressor Oil Filter.

a. Removal. Remove the compressor oil filter as shown in figure 3-21.

b. Cleaning. Clean the compressor oil filter as specified in figure 3-21. (Also, refer to figure 3-5).

c. Installation. Install the compressor oil filter a shown in figure 3-21.


COVER NUT
NUT GASKET
COVER
O-RING GASKET
THERMAL BYPASS BASE
1
LOCKING NUT
O-RING GASKET SEAT
CENTER STUD
ELEMENT NUT
WASHER
ELEMENT
2
ELEMENT
SOLVENT
3
AIR HOSE NOZZLE
ELEMENT
4
TS5-4310-354-14/3-2

REMOVAL:

STEP 1. REMOVE THE NUT THAT SECURES THE FILTER COVER TO THE THERMAL BYPASS BASE. REMOVE THE NUT GASKET, COVER, AND COVER O-RING GASKET FROM COVER SEAT IN BASE.

STEP 2. REMOVE THE LOCKING NUT, ELEMENT NUT, AND WASHER FROM CENTER STUD. LIFT ELEMENT OFF STUD.

CLEANING:

STEP 1. WIPE THE INSIDE OF THE COVER AND THE COVER O-RING GASKET WITH A CLEAN, LINT-FREE CLOTH MOISTENED WITH SOLVENT, FED SPEC P-D-680, TYPE II, OR EQUIVALENT. (REFER TO FIG 3-7.)

CAUTION

DO NOT SCRAPE OR WIRE BRUSH THE AIR COMPRESSOR FILTER ELEMENT. DAMAGE OF ELEMENT MAY RESULT.

STEP 2. SOAK AND AGITATE THE ELEMENT IN A CONTAINER OF SOLVENT, SUCH AS FED SPEC P-D-680, TYPE II, OR EQUIVALENT, UNTIL ELEMENT IS CLEAN.

STEP 3. DRY THE ELEMENT THOROUGHLY WITH COMPRESSED AIR.

INSTALLATION:

STEP 1. CAREFULLY INSTALL COVER O-RING GASKET IN GROOVE OF BASE. INSTALL ELEMENT ON CENTER STUD.

STEP 2. INSTALL WASHER AND ELEMENT NUT ON STUD AND TIGHTEN FINGER TIGHT TO SECURE ELEMENT IN POSITION. INSTALL LOCKING NUT ON STUD AND TIGHTEN AGAINST ELEMENT NUT.

STEP 3. CAREFULLY INSTALL COVER OVER ELEMENT AND STUD. SEAT COVER ON O-RING GASKET IN BASE, INSTALL COVER NUT GASKET AND COVER NUT.

Figure 3-21. Compressor oil filter, removal and installation.

3-26. Quick Start Assembly.

a. *Fuel Cylinder Removal.* Remove the quick start assembly fuel cylinder as shown in figure 3-22.

b. *Fuel Cylinder Installation.* Install the quick start assembly fuel cylinder as shown in figure 3-22.

STEP 1. REMOVE WINGNUTS, LOCKWASHERS, AND CLAMP THAT SECURE FUEL CYLINDER TO HOUSING.

WARNING

DO NOT MISHANDLE OR PUNCTURE THE FUEL CYLINDER. THE CYLINDER CONTAINS AN ETHER BASE MIXTURE THAT IS EXTREMELY TOXIC, VOLATILE, AND COMBUSTIBLE.

STEP 2. UNSCREW AND REMOVE THE CYLINDER FROM VALVE ASSEMBLY. DISCARD THE GASKET.

STEP 3. SCREW THE VALVE CAP ONTO VALVE ASSEMBLY CYLINDER OPENING UNTIL READY TO INSTALL A NEW CYLINDER.

INSTALLATION:

STEP 1. REMOVE VALVE CAP FROM CYLINDER OPENING ON TOP OF VALVE ASSEMBLY.

NOTE

TIGHTEN FUEL CYLINDER HAND TIGHT ONLY IN VALVE ASSEMBLY. DO NOT OVERTIGHTEN.

STEP 2. INSTALL A NEW GASKET IN VALVE ASSEMBLY. INSTALL A NEW FUEL CYLINDER IN VALVE ASSEMBLY. SCREW IN UNTIL HAND TIGHT ONLY.

STEP 3. INSTALL CYLINDER CLAMP AND SECURE WITH LOCKWASHERS AND WINGNUTS.

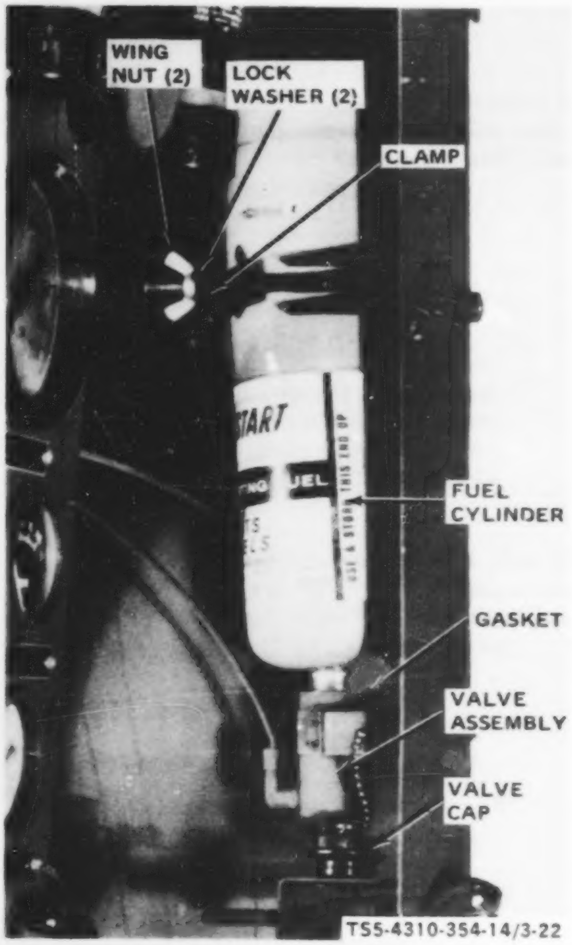


Figure 3-22. Quick start assembly cylinder, removal and installation.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

4-1. Inspecting and Servicing the Equipment.

a. *Inspecting the Equipment.* When the air compressor unit is received, inspect as follows prior to installation and use.

(1) Inspect for, and tighten, any loose nuts, bolts, and screws.

(2) Inspect all controls, instruments, and gauges for damage and loose mounting.

(3) Inspect electrical wiring for frayed insulation, loose connections, or any other damage. (Refer to wiring diagram, figure 1-3.)

(4) Inspect condition of fan drive belt and belt tension. Make certain that fan is securely mounted and that there is clearance between fan blades and fan guard. (Refer to figure 4-5 for fan belt adjustment.)

(5) Inspect all piping, air tubing, and hose assemblies for loose connections and damage.

b. *Servicing the Equipment.* Prior to installation and use, service the air compressor unit as follows.

(1) Perform all daily and before operation preventive maintenance checks and services (PMCS) (table 3-1).

(2) Lubricate the equipment in accordance with LO 5-4310-354-12, figure 3-1.

(3) Fill the fuel tank with proper grade of diesel fuel. (Refer to para 1-10.*b*. for recommended fuel and capacity.)

(4) Fill the radiator to a level approximately 2 inches (50.8 mm) below radiator filler neck. (Refer to para 1-10.*b*. for capacity and table 2-1 for antifreeze data.)

WARNING

To prevent serious burns, take necessary precautions when filling battery with electrolyte. Do not allow electrolyte to come in contact with skin or eyes. Use rubber gloves and protective clothing.

(5) Fill battery with electrolyte to a level of approximately ⅜ inch (9.5 mm) above the cell plates. Specific gravity, checked with a hydrometer, will be 1.250 minimum.

NOTE

Battery is 12 volt, negative ground.

4-2. Installation.

a. Pull the air compressor skid unit to the worksite with a suitable vehicle and pulling device, such as chains or cables. The pulling device may be attached to either end of the skid frame.

b. Locate the unit as near as possible to the work area. The unit should be as level as possible and, in no case, should the unit be operated out of level more than 15 degrees in any direction.

Section II. MOVEMENT TO A NEW WORKSITE

4-3. Dismantling for Movement.

a. Disconnect all air tools from air service hoses and stow the tools in their proper area.

b. Unlock hose reel and wind service hose onto reel. Lock the reel.

c. When auxiliary hoses are attached to the unit service valves, disconnect and coil the auxiliary hose(s). Stow the hose(s) in their proper area.

d. Connect free end of hose reel hose to one of th service valves to prevent hose from uncoiling from hose reel.

e. Close and latch both side doors.

4-4. Reinstallation After Movement. Refer to paragraph 4-2 for installation instructions after movement to a new worksite.

Section III. REPAIR PARTS, SPECIAL TOOLS, AND EQUIPMENT

4-5. Tools and Equipment. Tools and equipment usually listed in the Basic Issue Items List and Items Troop Installed or Authorized List do not apply to this equipment.

4-6. Special Tools and Equipment. Special Tools and Equipment required for organizational maintenance are listed in Repair Parts and Special Tools List Manual, TM 5-4310-354-24P.

4-7. Maintenance Repair Parts. Repair parts and equipment are listed and illustrated in the Repair Parts and Special Tools Lists manual TM 5-4310-354-24P.

Section IV. LUBRICATION INSTRUCTIONS

4-8. General.

a. This section contains lubrication instructions which are supplemental to, and not specifically covered in, the lubrication order.

b. In addition to detailed lubrication instructions following, refer to LO 5-4310-254-12, figure 3-1.

4-9. Detailed Lubrication Instructions.

a. General. Keep all lubricants in closed containers and store in a clean, dry area away from external heat. Do not allow dust, dirt, or other foreign matter to mix with the lubricants. Keep all lubrication equipment clean and ready for use.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. Cleaning. Keep all external parts clean of lubricants. Wipe areas clean with a cloth moistened with a solvent, Federal Specification P-D-680, Type II, or equivalent. Before lubricating, wipe all lubrication points and areas free of dirt and grease. Clean all lubrication points and areas after lubrication to prevent accumulation of dirt and foreign matter.

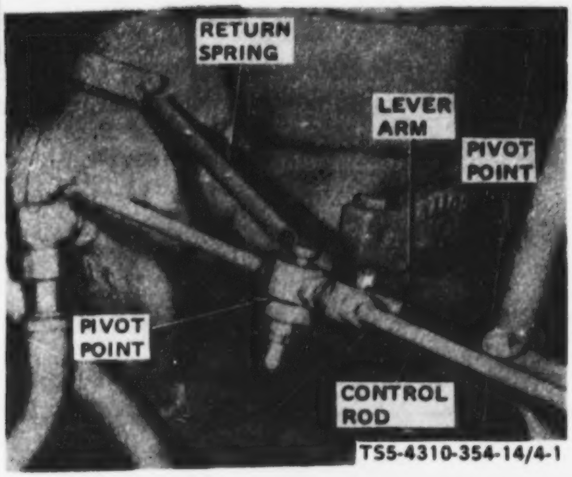
c. Points of Lubrication.

CAUTION

Overlubrication may cause equipment failure or damage to working parts. Lubricate at proper intervals and use specified grade and quantities of lubricants.

(1) Service the lubrication points at proper intervals as specified on LO 5-4310-354-12, figure 3-1.

(2) Lubricate the speed control linkage as shown in figure 4-1.



TS5-4310-354-14/4-1

STEP 1. WIPE ARM, PIVOT POINTS, CONTROL ROD AND SPRING WITH A CLOTH MOISTENED WITH SOLVENT, FED SPEC P-D-680, OR EQUIVALENT. THEN, WIPE DRY.

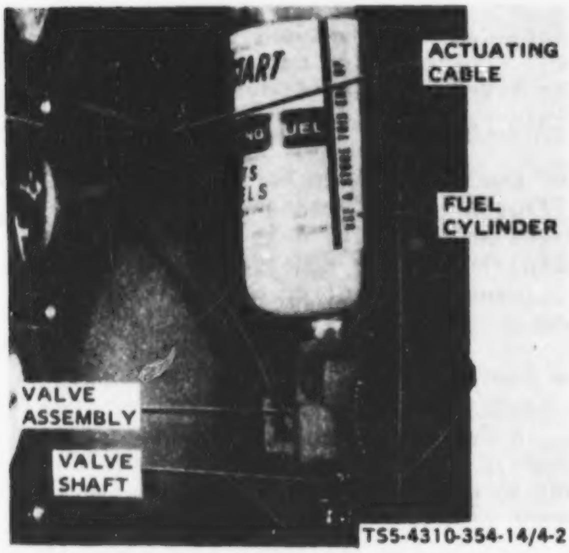
STEP 2. USING AN OIL CAN, APPLY 3 TO 5 DROPS OF ENGINE OIL TO ALL PIVOT POINTS AND SPRING.

NOTE

REFER TO LO5-4310-354-12, FIG 3-1, FOR LUBRICANTS.

Figure 4-1. Speed control linkage lubrication.

(3) Lubricate the quick start assembly as shown in figure 4-2.



TS5-4310-354-14/4-2

STEP 1. REMOVE THE FUEL CYLINDER(FIG 3-22). USE AN OIL CAN TO APPLY 3 TO 5 DROPS OF ENGINE OIL ON EXPOSED PORTION OF MECHANICAL VALVE SHAFT.

STEP 2. WIPE ACTUATING CABLE WITH A CLOTH MOISTENED WITH SOLVENT, FED SPEC P-D-680, OR EQUIVALENT. THEN, WIPE DRY. APPLY A FEW DROPS OF OIL TO THE CABLE.

STEP 3. ACTUATE THE VALVE A FEW TIMES WITH THE CABLE TO DISTRIBUTE OIL ON CABLE AND ALLOW OIL TO ENTER VALVE. WIPE OFF EXCESS OIL.

STEP 4. INSTALL FUEL CYLINDER (FIG 3-22).

NOTE

REFER TO LO5-4310-354-12, FIG 3-1, FOR LUBRICANTS.

Figure 4-2. Quick start assembly lubrication.

NOTE

The engine starting motor, alternator, and water pump do not require lubrication except at overhaul. The fuel injection pump is lubricated by flow of fuel oil through the pump.

Section V. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-10. General. This section contains preventive maintenance checks and services (PMCS) for organizational maintenance level. These services are to be performed quarterly as indicated in table 4-1. For operator/crew level PMCS refer to table 3-1.

4-11. Preventive Maintenance Checks and ices. Organizational preventive maintenance c and services are listed in table 4-1. Perform checks and services in the numerical sequence in the first column of the table.

Table 4-1. Organizational Preventive Maintenance Checks and Services

Q-Quarterly H-Hours

Item No.	Interval		Item to be Inspected	Procedures
	Q	H		
1.		100	Engine Fuel Filter	Replace engine fuel filter every 100 hours of operation (fig. 3-8).
2.	●		Drive Belt	Check for worn, frayed, or broken drive belt. Check tension of belt (fig. 3-9). Tighten dri belt as shown in figure 4-5.
3.	●		Battery	Check battery cable connections and mounting (fig. 3-10). Check filler cap vent holes, electrolyte level and specific gravity. Clean and lubricate battery terminals (fig. 3-18).
4.	●		Linkage Speed Control	Check speed control linkage for freedom of movement (fig. 3-11). Clean and lubricate the linkage pivot points (fig. 4-1). Adjust the speed control linkage as necessary (fig. 4-6). Refer adjustment to Direct or General Support maintenance.
5.	●		Quick Start Assembly	Remove the fuel cylinder (fig. 3-14 and 3-22). Weigh the cylinder to determine amount of fuel remaining. A full cylinder weighs 35 ounces (992.25 grams). An empty cylinder weighs 17 ounces (481.95 grams). The actuating valve is measured shot of 2-1/2 cc per shot. Calculate remaining shots in the cylinder [15.6 shots (or 39 cc) per ounce (28.35 grams) of weight]. Replace the fuel cylinder when 95% used, or whe the cylinder weighs approximately 18 ounces (510.27 grams). Install new cylinder in accordance with figure 3-22.

All data on page 4-5 deleted

4-12. Radiator Hose Service. Service the radiator hoses as shown in figure 4-3.

STEP 1. REMOVE RADIATOR CAP AND OPEN RADIATOR DRAIN (FIG 3-6) TO REMOVE COOLANT FROM RADIATOR. WHEN COOLANT FLOW STOPS, CLOSE DRAIN.

STEP 2. REMOVE HOSE CLAMPS AND RADIATOR HOSE TO BE SERVICED. (UPPER OR LOWER.)

STEP 3. INSTALL RADIATOR HOSE AND SECURE WITH HOSE CLAMPS.

STEP 4. FILL RADIATOR WITH COOLANT TO A LEVEL TWO INCHES (50.8 MM) BELOW FILLER NECK. REFER TO TABLE 2-1.

STEP 5. INSTALL RADIATOR CAP AND CHECK HOSE CONNECTIONS FOR LEAKS.

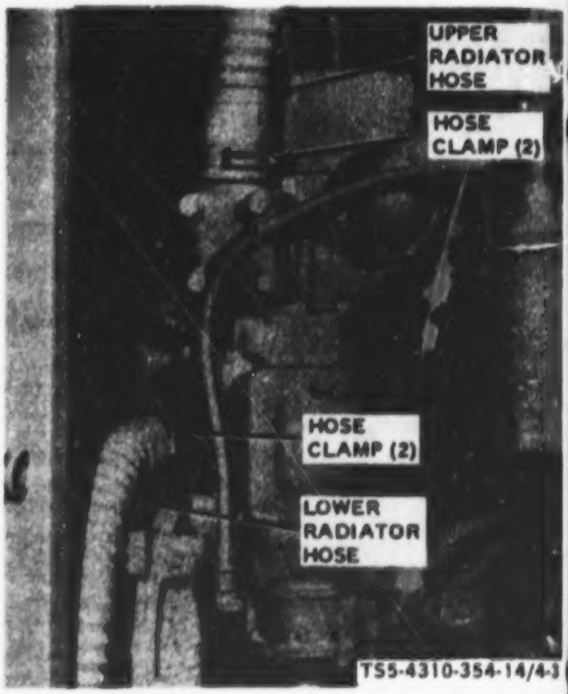

UPPER RADIATOR HOSE
HOSE CLAMP (2)
HOSE CLAMP (2)
LOWER RADIATOR HOSE
TS5-4310-354-14/4-3

Figure 4-3. Radiator hose service.

4-13. Fuel Tank and Fuel Lines Service. Service the fuel tank and fuel lines as shown in figure 4-4.

STEP 1. REMOVE FUEL TANK FILLER CAP AND INSPECT CONDITION OF CAP GASKET (FIG 3-19).

STEP 2. REMOVE FUEL TANK DRAIN PLUG AND DRAIN FUEL FROM TANK. WHEN FUEL FLOW STOPS, INSTALL DRAIN PLUG (FIG 3-19).

STEP 3. CLEAN EXTERIOR OF TANK AROUND FUEL LINE CONNECTIONS AND FUEL LEVEL SENDING UNIT WITH A CLEAN CLOTH SOAKED WITH CLEANING SOLVENT, FED SPEC P-D-680, TYPE II, DRY THOROUGHLY.

STEP 4. DISCONNECT AND REMOVE FUEL PICK-UP AND RETURN HOSE ASSEMBLIES AS NECESSARY FOR SERVICE.

STEP 5. DISCONNECT FUEL LEVEL SENDING UNIT WIRE ASSEMBLY AND GROUND WIRE. REMOVE SENDING UNIT AS NECESSARY FOR TESTING AND REPLACEMENT.

STEP 6. REMOVE HOSE CLAMPS, FILLER NECK, AND FILLER NECK HOSE. REMOVE FUEL TANK STRAP NUTS, WASHERS, CAP SCREWS, STRAPS, AND WEBBING AS NECESSARY FOR SERVICE.

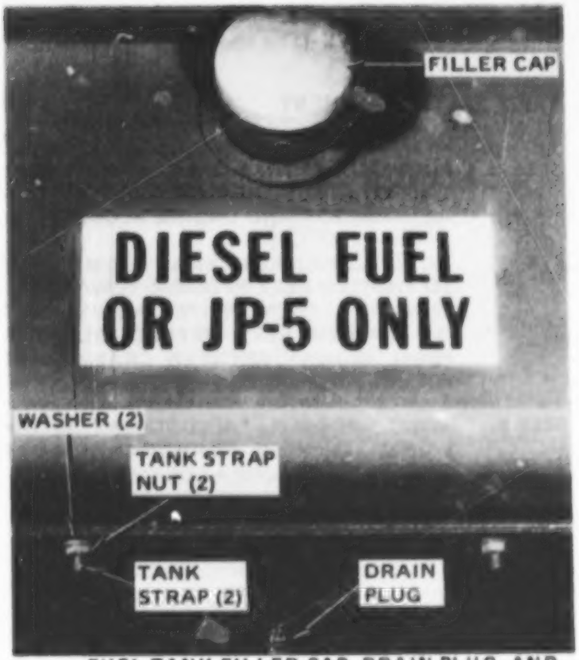
STEP 7. INSPECT AND REPLACE WEBBING AS NECESSARY, EXAMINE TANK STRAPS FOR DAMAGED THREADS AND BREAKS. REPAIR OR REPLACE AS NECESSARY; INSTALL WEBBING AND TANK STRAPS. SECURE THE TANK STRAPS WITH NUTS, WASHERS, AND CAP SCREWS SO THAT FUEL TANK RESTS TIGHTLY ON FRAME.

STEP 8. INSTALL FILLER NECK HOSE, HOSE CLAMPS, AND FILLER NECK; TIGHTEN HOSE CLAMPS.

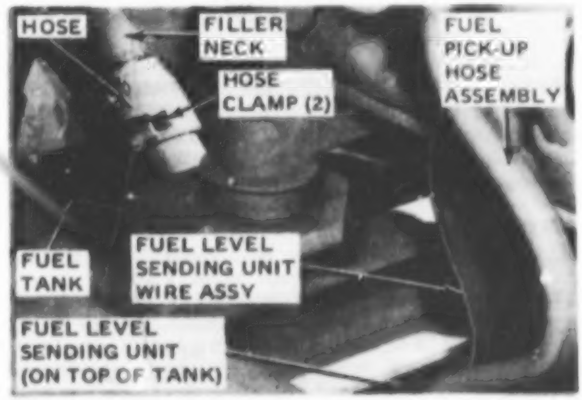
STEP 9. INSTALL FUEL LEVEL SENDING UNIT AND CONNECT WIRE ASSEMBLY AND GROUND WIRE (FIG 1-3).

STEP 10. INSTALL FUEL PICK-UP AND RETURN HOSE ASSEMBLIES AS NECESSARY.

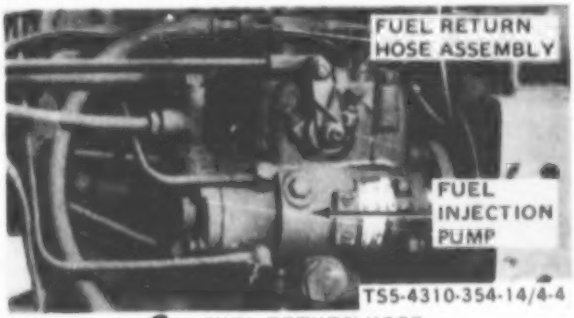
STEP 11. FILL THE FUEL TANK WITH PROPER GRADE OF FUEL; INSTALL FUEL TANK FILLER CAP. START THE ENGINE AND CHECK FOR LEAKS.


FILLER CAP
DIESEL FUEL OR JP-5 ONLY
WASHER (2)
TANK STRAP NUT (2)
TANK STRAP (2)
DRAIN PLUG

A FUEL TANK FILLER CAP, DRAIN PLUG, AND TANK STRAPS


HOSE
FILLER NECK
FUEL PICK-UP HOSE ASSEMBLY
HOSE CLAMP (2)
FUEL TANK
FUEL LEVEL SENDING UNIT WIRE ASSY
FUEL LEVEL SENDING UNIT (ON TOP OF TANK)

B FUEL TANK, FILLER NECK, AND PICK-UP HOSE


FUEL RETURN HOSE ASSEMBLY
FUEL INJECTION PUMP
TS5-4310-354-14/4-4

C FUEL RETURN HOSE

Figure 4-4. Fuel tank and fuel lines service.

4-14. Drive Belt Service and Adjustment. Service and adjust the drive belt as shown in figure 4-5.

DRIVE BELT ADJUSTMENT

STEP 1. LOOSEN ALTERNATOR PIVOT NUT. LOOSEN ADJUSTING ARM CAP SCREW ON ALTERNATOR AND ENGINE BLOCK.

STEP 2. MOVE ALTERNATOR AWAY FROM ENGINE TO TIGHTEN BELT TENSION; TOWARD ENGINE TO LOOSEN. PROPER ADJUSTMENT IS 3/4-INCH BELT DEFLECTION AT A POINT MIDWAY BETWEEN CRANKSHAFT PULLEY AND WATER PUMP PULLEY.

STEP 3. WHEN PROPER ADJUSTMENT IS OBTAINED, TIGHTEN ADJUSTING ARM CAP SCREWS AT ENGINE BLOCK AND ALTERNATOR AND TIGHTEN ALTERNATOR PIVOT NUT.

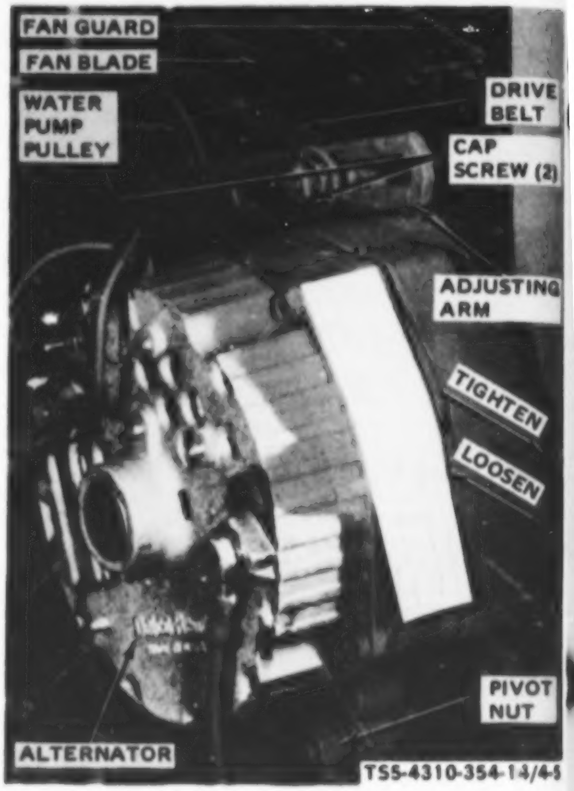
BELT REPLACEMENT

STEP 1. REMOVE THE FAN GUARD. LOOSEN ALTERNATOR PIVOT NUT AND ADJUSTING ARM CAP SCREWS ON ALTERNATOR AND ENGINE BLOCK.

STEP 2. MOVE ALTERNATOR TOWARD ENGINE TO LOOSEN DRIVE BELT. REMOVE BELT FROM ALTERNATOR DRIVE PULLEY, WATER PUMP PULLEY, AND CRANKSHAFT PULLEY.

STEP 3. REMOVE DRIVE BELT BY WEAVING OVER FAN BLADES.

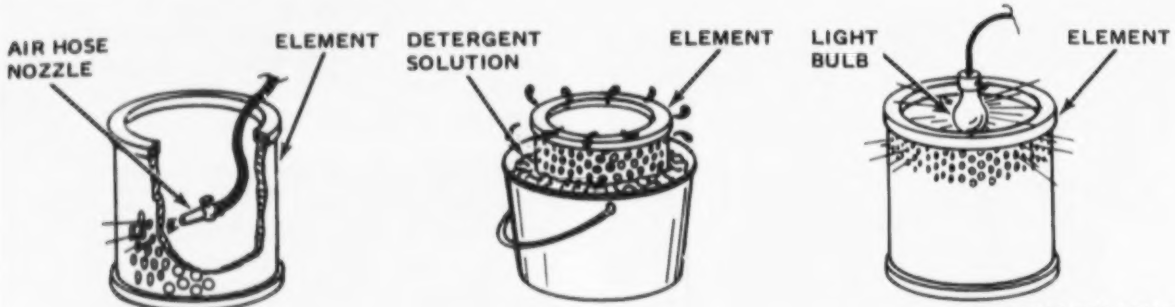
STEP 4. INSTALL NEW DRIVE BELT BY WEAVING OVER FAN BLADES AND RESTING BELT IN GROOVE OF CRANKSHAFT PULLEY, WATER PUMP PULLEY, AND ALTERNATOR PULLEY.



STEP 5. ADJUST BELT TENSION BY MOVING ALTERNATOR AWAY FROM ENGINE UNTIL A BELT DEFLECTION OF 3/4-INCH IS OBTAINED BETWEEN CRANKSHAFT PULLEY AND WATER PUMP PULLEY. THEN, TIGHTEN ALTERNATOR ADJUSTING ARM CAP SCREWS AT ENGINE BLOCK AND ALTERNATOR. TIGHTEN ALTERNATOR PIVOT NUT. INSTALL FAN GUARD.

Figure 4-5. Drive belt service and adjustment.

4-15. Air Cleaner Service. Service the engine and air compressor air cleaner as shown in figure 4-6.



A DRY OR DUSTY ELEMENT CLEANING

B OILY OR SOOTY ELEMENT CLEANING

C INSPECTING FOR DAMAGE

NOTE

THE FOLLOWING SERVICE INSTRUCTIONS ARE APPLICABLE TO BOTH THE ENGINE AND COMPRESSOR AIR CLEANER.

STEP 1. REFER TOFIGURE 3-12 AND REMOVE THE AIR CLEANER ELEMENT.

CAUTION

DO NOT RUPTURE ELEMENT, DAMAGE FINS OR SEALING SURFACES. DO NOT ALLOW DUST OR DIRT TO DEPOSIT ON CLEAN AIR SIDE (OUTSIDE) OF ELEMENT. AIR PRESSURE USED FOR CLEANING SHALL NOT EXCEED 100 PSI.

STEP 2. CLEAN ELEMENTS AS FOLLOWS:

DRY OR DUSTY ELEMENT: USE COMPRESSED AIR HOSE TO BLOW CLEAN, DRY AIR THROUGH ELEMENT IN OPPOSITE DIRECTION OF NORMAL AIR FLOW. (BLOW FROM INSIDE OUT.) KEEP NOZZLE AT LEAST ONE INCH AWAY FROM ELEMENT MOVING NOZZLE UP AND DOWN WHILE ROTATING ELEMENT.

OILY OR SOOTY ELEMENT: SOAK THE ELEMENT IN A SOLUTION OF WATER AND NON-SUDSING TYPE HOUSEHOLD DETERGENT FOR 15-MINUTES. RINSE WITH GARDEN TYPE WATER HOSE, 40 PSI MAXIMUM PRESSURE, UNTIL THOROUGHLY CLEANED AND RINSED. AIR DRY OR USE WARM FLOWING AIR, MAXIMUM 160°F (71°C).

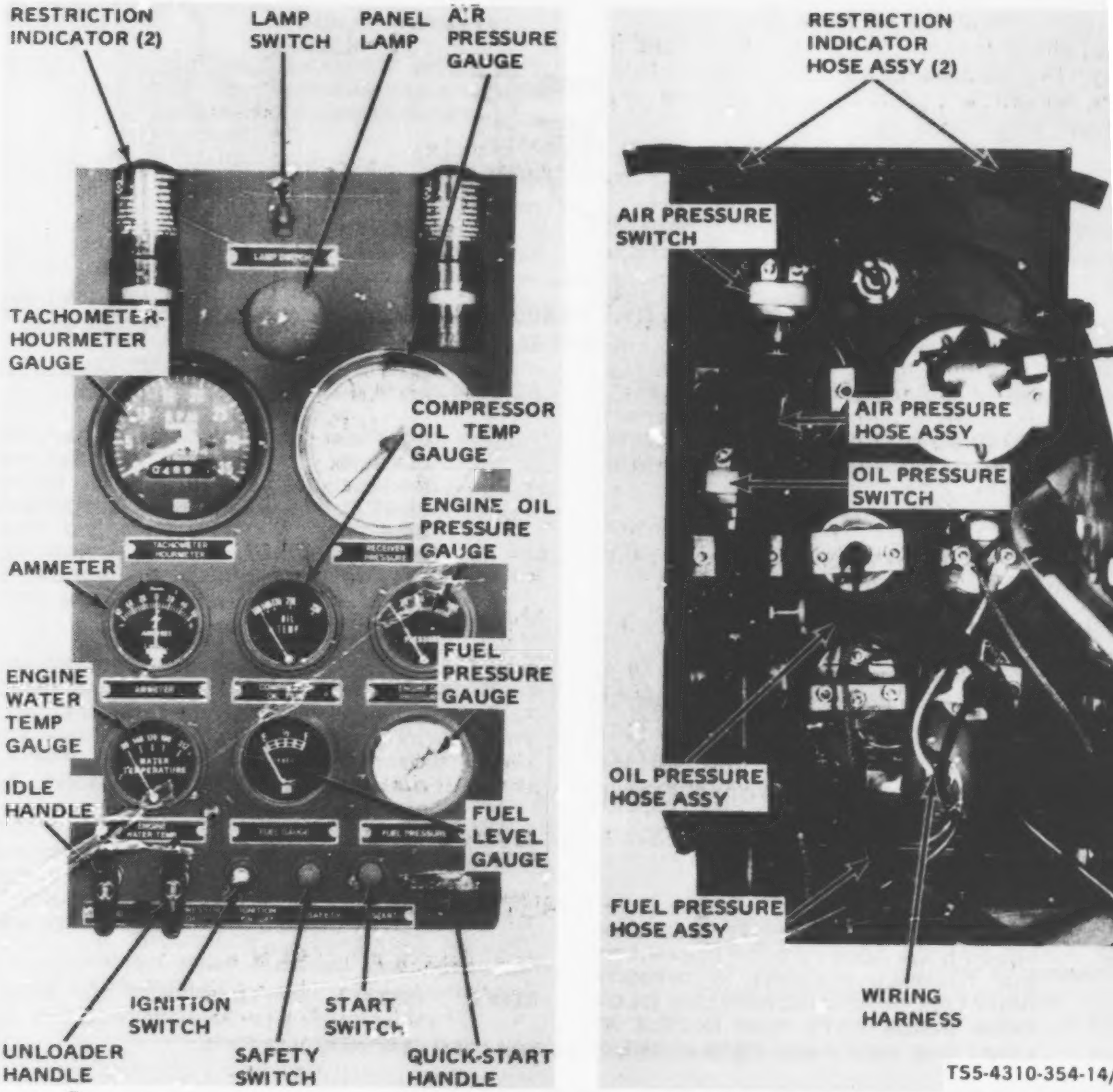
STEP 3. AFTER ELEMENT IS THOROUGHLY DRYED, PLACE A BRIGHT LIGHT INSIDE ELEMENT AND ROTATE ELEMENT SLOWLY TO INSPECT FOR DAMAGE. IF ANY RUPTURE, HOLES, OR DAMAGED FINS OR DAMAGED GASKETS ARE FOUND, REPLACE ELEMENT.

STEP 4. REMOVE THE BAFFLE FROM DUST CUP ASSEMBLY AND CLEAN ACCUMULATED DIRT FROM DUST CUP. WIPE CLEAN WITH CLOTH SOAKED WITH SOLVENT, FED SPEC P-D-680, TYPE II.

STEP 5. INSTALL BAFFLE IN DUST CUP. REFER TO FIGURE 3-12 AND INSTALL THE AIR CLEANER ELEMENTS.

Figure 4-6. Air cleaner service.

4-16. Controls and Instruments Service. Service the controls and instruments as shown in figure 4-7.


RESTRICTION INDICATOR (2)
LAMP SWITCH
PANEL LAMP
AIR PRESSURE GAUGE
TACHOMETER-HOURMETER GAUGE
COMPRESSOR OIL TEMP GAUGE
ENGINE OIL PRESSURE GAUGE
AMMETER
FUEL PRESSURE GAUGE
ENGINE WATER TEMP GAUGE
IDLE HANDLE
FUEL LEVEL GAUGE
IGNITION SWITCH
START SWITCH
UNLOADER HANDLE
SAFETY SWITCH
QUICK-START HANDLE
RESTRICTION INDICATOR HOSE ASSY (2)
AIR PRESSURE SWITCH
AIR PRESSURE HOSE ASSY
OIL PRESSURE SWITCH
OIL PRESSURE HOSE ASSY
FUEL PRESSURE HOSE ASSY
WIRING HARNESS
TS5-4310-354-14/

A INSTRUMENT PANEL FRONT VIEW

B INSTRUMENT PANEL REAR VIEW

STEP 1. CLEAN ALL CONTROLS AND INSTRUMENTS WITH A CLEAN CLOTH SOAKED WITH CLEANING SOLVENT FED SPEC P-D-680, TYPE II. DRY THROUGHLY.

STEP 2. INSPECT ALL GAUGE FACES FOR CRACKS AND BREAKS.

STEP 3. INSPECT ALL CONTROLS AND INSTRUMENTS FOR LOOSE MOUNTING, SECURE HOSE CONNECTIONS, AND TIGHTEN W
TERMINAL CONNECTIONS AS NECESSA

STEP 4. INSPECT HOSES AND CONTROL CAB
FOR KINKS, CRACKS, OR ANY OTH
DEFECT.

STEP 5. REFER TO SECTION XVIII OF T
CHAPTER FOR MAINTENANCE OF C
TROLS AND INSTRUMENTS.

Figure 4-7. Controls and Instruments service.

4-17. Quick Start Assembly Service. Service the quick start assembly as shown in figure 4-8.

WARNING

DO NOT PUNCTURE OR MISHANDLE FUEL CYLINDER. THE CYLINDER CONTAINS AN ETHER BASE MIXTURE WHICH IS EXTREMELY TOXIC, VOLATILE, AND COMBUSTIBLE.

STEP 1. REFER TOFIGURE 3-14 AND REMOVE THE FUEL CYLINDER.

STEP 2. LOOSEN SCREW ON ACTUATING VALVE LEVER CABLE STOP AND CONTROL CABLE CLAMP SCREW. REMOVE THE CONTROL CABLE FROM ACTUATING VALVE ASSEMBLY. APPLY A FEW DROPS OF LUBRICATING OIL ON CONTROL CABLE. CHECK OPERATION OF CABLE BY PULLING AND PUSHING THE QUICK-START ACTUATING HANDLE ON INSTRUMENT PANEL. CHECK CABLE FOR KINKS AND BREAKS.

STEP 3. APPLY A LIGHT FILM OF LUBRICATING OIL ON EXPOSED PORTION OF MECHANICAL VALVE SHAFT.

STEP 4. INSTALL CONTROL CABLE THROUGH CABLE CLAMP, ATTACH TO LEVER AND TIGHTEN SCREWS. ACTUATE CONTROL CABLE A FEW TIMES TO CHECK FOR ANY BINDING.

STEP 5. REFER TO FIGURE 3-14 AND INSTALL FUEL CYLINDER, AS NECESSARY.

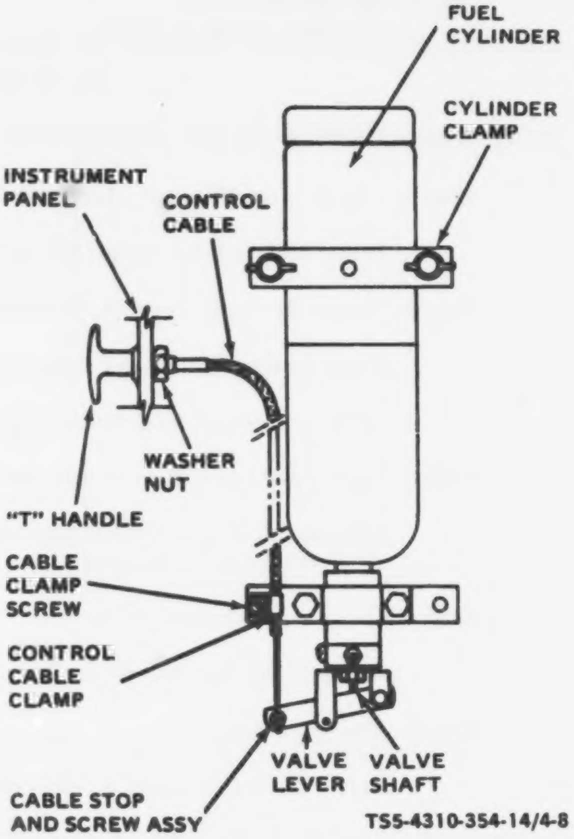


Figure 4-8. Quick start assembly service.

Section VI. TROUBLESHOOTING

4-18. Troubleshooting.

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the air compressor unit. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you to determine probable causes and corrective actions to take. You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

4-19. Organizational Maintenance Troubleshooting. The Orgsnizational Maintenance troubleshooting is found in table 4-1. For troubleshooting within the scope of Operator/Crew, refer to table 3-2 and for Direct Support and General Support Maintenance level, table 5-1. Maintenance functions within the scope of each maintenance level is indicated in the Maintenance Allocation Chart, Appendix C.

NOTE

Before you use this table, be sure you have performed all applicable operating checks.

Table 4-2. Organizational Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE

1. ENGINE FAILS TO CRANK WHEN START BUTTON IS PRESSED.

Step 1. Check to see if battery electrolyte level is above the top of the plates.

If electrolyte level is low, service the battery in accordance with figure 3-10.

Step 2. Inspect for loose, corroded, or broken battery cables. Inspect for damaged battery.

Refer to figure 3-18 and inspect battery cables.

Refer to Section VIII for maintenance of battery box group.

Step 3. Inspect start switch on instrument panel for loose or broken wire connections.

If wires are loose, tighten terminal connections. Refer to para 4-61 and figure 4-34 f start switch maintenance.

Step 4. Check starting motor for defects.

Replace the starting motor (para 4-37).

Step 5. Any other cause.

Notify Direct Support or General Support Maintenance of any other cause.

2. ENGINE CRANKS BUT FAILS TO START WHEN START BUTTON IS PRESSED.

Step 1. Check ignition switch. It must be in ON position.

Pull ignition switch outward to ON position.

Step 2. Safety pushbutton switch is not being pressed along with the start pushbutton switch.

Press safety pushbutton switch simultaneously with start pushbutton and hold safe pushbutton in until engine oil pressure reaches at least 4 psi (0.28 KG/CM^2).

Step 3. Check air cleaner restriction indicators on instrument panel for indication of air cleaners bei restricted.

Service the air cleaner (figure 4-6).

Step 4. Check for defective fuel transfer pump.

Replace the fuel transfer pump (para 4-43).

Step 5. Inspect for defective fuel injection nozzles.

Replace defective fuel injection nozzles (para 4-42).

Table 4-2. Organizational Troubleshooting – Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

2. ENGINE CRANKS BUT FAILS TO START WHEN START BUTTON IS PRESSED — continued.

Step 6. Inspect for clogged or pinched fuel lines.

Refer to para 4-44 for fuel line maintenance.

Step 7. Check fuel lines, hoses and fittings for damage.

Refer to para 4-31 for maintenance.

Step 8. Check valves for proper adjustment.

Adjust rocker arms (para 4-50).

Step 9. Any other cause.

Notify Direct or General Support Maintenance.

3. ENGINE MISSES OR RUNS ERRATICALLY.

Step 1. Inspect exhaust system for restriction.

Remove restriction or refer to para 4-47 for exhaust mainfold maintenance.

Step 2. Check for proper valve adjustment.

Adjust rocker arms (para 4-50).

Step 3. Inspect fuel transfer pump operation.

Replace a worn or defective fuel transfer pump (para 4-43).

Step 4. Check fuel injection nozzles for clogging or sticking.

Replace defective fuel injection nozzles (para 4-42).

Step 5. Check fuel lines, hoses, and fittings for tightness of connections pinching, and clogging.

Refer to para 4-31 and para 4-44 for maintenance.

Step 6. Check the speed control linkage for proper adjustment.

Adjust speed control linkage (para 4-74).

Step 7. Any other causes.

Notify Direct Support or General Support Maintenance.

Table 4-2. Organizational Troubleshooting - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

4. ENGINE LACKS POWER.

Step 1. Check for restriction in engine exhaust.

Remove any restriction. Refer to para 4-47 for maintenance of exhaust manifold.

Step 2. Check fuel lines, hoses, and fittings for tightness of connections, pinching, and clogging.

Refer to para 4-31 and para 4-44 for maintenance.

Step 3. Inspect fuel transfer pump operation.

Replace a worn or defective fuel transfer pump (para 4-43).

Step 4. Check fuel injection nozzles for clogging or sticking.

Replace defective fuel injection nozzles (para 4-42).

Step 5. Check speed control linkage adjustment.

Adjust the speed control linkage (para 4-74).

Step 6. Check valve clearance.

Adjust the rocker arms (para 4-50).

Step 7. Any other cause.

Notify Direct Support or General Support Maintenance.

5. ENGINE KNOCKS, DEVELOPS EXCESSIVE NOISE, OR VIBRATES.

Step 1. Check engine for overload or operating at excessive speed.

Adjust the speed control linkage (para 4-74).

Step 2. Check to see if engine is overheating.

Refer to para 4-45 for maintenance of cooling fan, water pump, and thermostat. S para 4-14 for drive belt adjustment, para 4-12 for radiator hose service, and para 4-29 f maintenance of radiator and oil cooler group.

Step 3. Check fuel injection nozzles for clogging.

Replace fuel injection nozzles (para 4-42).

Table 4-2. Organizational Troubleshooting – Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

5. ENGINE KNOCKS, DEVELOPS EXCESSIVE NOISE, OR VIBRATES — continued.

Step 4. Inspect valves for sticking and correct clearance.

Adjust the rocker arms (para 4-50).

Step 5. Any other cause.

Notify Direct Support or General Support.

6. ENGINE HAS LOW OIL PRESSURE.

Step 1. Engine oil level too low or wrong grade of oil used.

Refer to LO 5-4310-354-12, figure 3-1.

Step 2. Defective engine oil pressure gauge.

Replace the engine oil pressure gauge (para 4-57).

Step 3. Defective engine oil pressure switch.

Replace the oil pressure switch (para 4-67).

Step 4. Any other cause.

Notify Direct Support or General Support Maintenance.

7. ENGINE OVERHEATING.

Step 1. Check drive belt for slipping.

Adjust drive belt tension (figure 4-5).

Step 2. Check for restriction in exhaust system.

Remove any restriction or refer to para 4-47 for exhaust manifold maintenance.

Step 3. Inspect for damaged cooling fan, leakage at water pump, and for defective thermostat.

Refer to para 4-45 for maintenance of the cooling fan, water pump, and thermostat.

Step 4. Inspect radiator for leakage and for damaged hoses.

See para 4-29 for maintenance of radiator and oil cooler group and figure 4-3 for radiator hose service.

Table 4-2. Organizational Troubleshooting - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

7. ENGINE OVERHEATING — continued.

Step 5. Inspect engine water temperature gauge for proper operation.

Replace a defective temperature gauge (para 4-64).

Step 6. Any other cause.

Notify Direct Support or General Support Maintenance.

8. ENGINE HAS LOW FUEL PRESSURE.

Step 1. Check for damaged fuel lines, hoses, and fittings.

Refer to para 4-31 for maintenance.

Step 2. Check for a damaged fuel pressure gauge.

Replace a defective fuel pressure gauge (para 4-59).

Step 3. Check for worn or damaged fuel transfer pump.

Replace a defective fuel transfer pump (para 4-43).

Step 4. Any other cause.

Notify Direct Support or General Support Maintenance.

9. ENGINE EXHAUST EXCESSIVELY BLACK.

Step 1. Check engine air cleaner restriction indicator for a restricted air flow.

Service the engine air cleaner (figure 4-6).

Step 2. Check for restriction in engine air intake system, other than air cleaner.

Remove any restriction or refer to para 4-46 for intake manifold maintenance.

Step 3. Check for restriction in exhaust system.

Remove any obstruction or refer to para 4-47 for exhaust manifold maintenance

Step 4. Check engine for overheating.

Refer to Malfunction number 7 and corrective action thereunder.

Step 5. Check for defective fuel injection nozzles.

Replace defective fuel injection nozzles (para 4-42).

Table 4-2. Organizational Troubleshooting - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

9. ENGINE EXHAUST EXCESSIVELY BLACK — continued.

Step 6. Any other cause.

Notify Direct Support or General Support Maintenance.

10. ENGINE EXHAUST EXCESSIVELY BLUE OR WHITE.

Step 1. Check to make certain proper grade of lubricating oil is being used for ambient operating temperatures.

LO 5-4310-354-12, figure 3-1.

Step 2. Check for too low engine operating temperature.

Thermostat is defective. Replace thermostat (para 4-45).

Step 3. Check for restricted engine air cleaner.

Service the engine air cleaner (figure 4-6).

Step 4. Any other cause.

Notify Direct Support or General Support Maintenance.

11. EXCESSIVE OIL CONSUMPTION.

Step 1. Check for use of proper grade of lubricating oil.

Refer to LO 5-4310-354-12, figure 3-1.

Step 2. Check for excessive crankcase pressure.

Service the engine crankcase breather (figure 3-2).

Step 3. Any other cause.

Notify Direct Support or General Support Maintenance.

12. EXCESSIVE FUEL CONSUMPTION.

Step 1. Check for loose connections and damaged fuel lines hoses, and fittings.

Refer to para 4-31 and para 4-44 for maintenance.

Table 4-2. Organizational Troubleshooting - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

12. EXCESSIVE FUEL CONSUMPTION — continued.

Step 2. Check fuel injection nozzles for proper operation.

Replace defective fuel injection nozzles (para 4-42).

Step 3. Any other cause.

Notify Direct Support or General Support Maintenance.

13. ENGINE STALLS AT LOW SPEED.

Step 1. Check engine idle speed on tachometer-hourmeter.

If idle speed is below 1000 rpm, adjust the speed control linkage (para 4-74).

Step 2. Check for restriction in exhaust system.

Remove restriction or refer to para 4-47 for exhaust manifold maintenance.

Step 3. Any other cause.

Notify Direct Support or General Support Maintenance.

14. ENGINE FAILS TO STOP.

Step 1. Check wiring between ignition switch and fuel injection pump solenoid terminals. Ch ignition switch for proper operation.

Tighten wiring connections. Replace a defective ignition switch (para 4-62).

Step 2. Any other cause.

Notify Direct Support or General Support Maintenance.

15. ENGINE STOPS SUDDENLY.

Step 1. Check for engine overheating (safety switch shutdown).

Refer to Malfunction number 7 and Corrective Actions thereunder.

Step 2. Check operation of engine water temperature shutdown switch.

Replace a defective water temperature shutdown switch (para 4-68).

Table 4-2. Organizational Troubleshooting – Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

15. ENGINE STOPS SUDDENLY — continued.

Step 3. Check for low engine oil pressure (safety switch shutdown).

Add oil to crankcase as necessary. Refer to LO 5-4310-354-12, figure 3-1.

Step 4. Check operation of engine oil pressure switch.

Replace a defective engine oil pressure switch (para 4-67).

Step 5. Check for air compressor overheating (safety switch shutdown).

Add oil to separator tank as necessary. Refer to LO 5-4310-354-12, figure 3-1.

Step 6. Check operation of compressor oil temperature shutdown switch.

Replace a defective compressor oil temperature shutdown switch (para 4-70).

Step 7. Check for engine overspeed trip (safety shutdown switch).

Check all wiring connections to engine overspeed switch (refer to wiring diagram, figure 1-3). Check overspeed switch transmitter function. Replace defective transmitter (para 4-69). Overspeed indicates malfunction of fuel injection pump or other engine malfunction. Notify Direct Support or General Support Maintenance of this engine overspeed shutdown.

Step 8. Any other cause.

Notify Direct Support or General Support Maintenance.

AIR COMPRESSOR

16. AIR COMPRESSOR OVERHEATING.

Step 1. Check for proper level and grade of oil in separator tank.

Add oil of proper grade as necessary. Refer to LO 5-4310-354-12, figure 3-1.

Step 2. Check for oil cooler obstructions and evidence of leakage.

Remove all obstructions. As necessary, refer to para 4-29 for radiator and oil cooler group maintenance.

Step 3. Inspect compressor oil temperature gauge for damage.

Replace a defective temperature gauge (para 4-56).

Table 4-2. Organizational Troubleshooting - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

AIR COMPRESSOR — continued

16. AIR COMPRESSOR OVERHEATING — continued.

Step 4. Thermal bypass valve is defective.

Notify Direct Support or General Support Maintenance.

Step 5. Any other cause.

Notify Direct Support or General Support Maintenance.

17. COMPRESSOR IS NOISY.

Step 1. Check level of oil in separator tank.

Add proper grade of oil as necessary. Refer to LO 5-4310-354-12, figure 3-1.

Step 2. Check operation of air pressure regulator by observing load and unload pressures.

Normal load pressure is 80 psi (5.6 KG/CM^2) and unload pressure is 105 psi (7.4 KG/CM If unit is not operating in this range, the air pressure regulator requires adjustment or defective. Notify Direct Support or General Support Maintenance.

Step 3. Any other cause.

Notify Direct Support or General Support Maintenance.

18. COMPRESSOR NOT OPERATING TO FULL CAPACITY OR PRESSURE.

Step 1. Check air cleaner restriction indicator for indication of needed element service.

Service the compressor air cleaner (figure 4-6).

Step 2. Check air lines, hoses, and fittings for loose connections, damaged hoses, and fittings.

Refer to para 4-33 for air lines, hoses, and fittings maintenance.

Step 3. Check air pressure regulator for leakage and proper adjustment.

Notify Direct Support or General Support Maintenance.

Step 4. Check speed control linkage for proper setting.

Adjust speed control linkage (para 4-74).

Table 4-2. Organizational Troubleshooting – Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

AIR COMPRESSOR — continued

18. COMPRESSOR NOT OPERATING TO FULL CAPACITY OR PRESSURE — continued.

Step 5. Any other cause.

Notify Direct Support or General Support Maintenance.

19. EXCESSIVE OIL CONSUMPTION.

Step 1. Inspect the compressor oil lines and oil cooler for leaks.

Tighten all connections as necessary. Refer to para 4-29 for radiator and oil cooler maintenance.

Step 2. Oil separator element may be damaged.

Notify Direct Support or General Support Maintenance.

Step 3. Any other cause.

Notify Direct Support or General Support Maintenance.

20. COMPRESSOR UNLOADS BUT ENGINE DOES NOT RETURN TO IDLE.

Step 1. Check speed control linkage.

Set and/or adjust speed control linkage (para 4-74).

Step 2. Any other cause.

Notify Direct Support or General Support Maintenance.

21. RECEIVER PRESSURE GAUGE ERRATIC.

Step 1. Inspect receiver pressure gauge for defect.

Replace the gauge (para 4-55).

Step 2. Any other cause.

Notify Direct Support or General Support Maintenance.

22. TACHOMETER-HOURMETER ERRATIC.

Step 1. Check the tachometer drive cable and adapter for defect. Also, inspect gauge for damage.

Replace any defective part (para 4-66).

Table 4-2. Organizational Troubleshooting - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

AIR COMPRESSOR — continued

22. TACHOMETER-HOURMETER ERRATIC — continued.

Step 2. Any other cause.

Notify Direct Support or General Support Maintenance.

23. AMMETER DOES NOT INDICATE CHARGE OR DISCHARGE.

Step 1. Inspect for loose wiring connections and damaged wires.

Tighten connections as necessary. Notify Direct Support or General Support Maintenance for repair or replacement of wiring harness leads.

Step 2. Check for loose alternator drive belt.

Adjust the drive belt (figure 4-5).

Step 3. Check ammeter for damage.

Replace the ammeter (para 4-65).

24. FUEL LEVEL GAUGE DOES NOT FUNCTION.

Step 1. Check for loose wire connection and damaged wire assemblies between gauge and sending unit

Tighten wire connections as necessary. Replace damaged wire assemblies.

Step 2. Check for defective fuel level sending unit or a damaged fuel level gauge.

Replace defective sending unit or gauge (para 4-58).

Step 3. Any other cause.

Notify Direct Support or General Support Maintenance.

25. AIR CLEANER RESTRICTION INDICATORS DO NOT FUNCTION OR WILL NOT RESET.

Step 1. Check the two restriction indicators for any damage.

Replace damaged restriction indicators (para 4-53).

Table 4-2. Organizational Troubleshooting – Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

AIR COMPRESSOR — continued

26. INSTRUMENT PANEL LAMP DOES NOT FUNCTION.

Step 1. Check for burned out bulb.

Remove lamp cover, lens, and replace the bulb.

Step 2. Check wire connections at lamp assembly and lamp switch.

Tighten connections as necessary. Replace any defective wires.

Step 3. Check for defective lamp switch or defective lamp assembly.

Replace defective lamp assembly or switch (para 4-54).

Section VII. MAINTENANCE OF EXHAUST MUFFLER GROUP

-20. General. The exhaust muffler group consists of he muffler rain cap, engine exhaust muffler, and he piping from the muffler to the engine exhaust nanifold.

4-21. Exhaust Muffler Group.

a. Removal and Disassembly. Remove the rain cap, exhaust muffler and piping from engine exhaust manifold as shown in figure 4-9.

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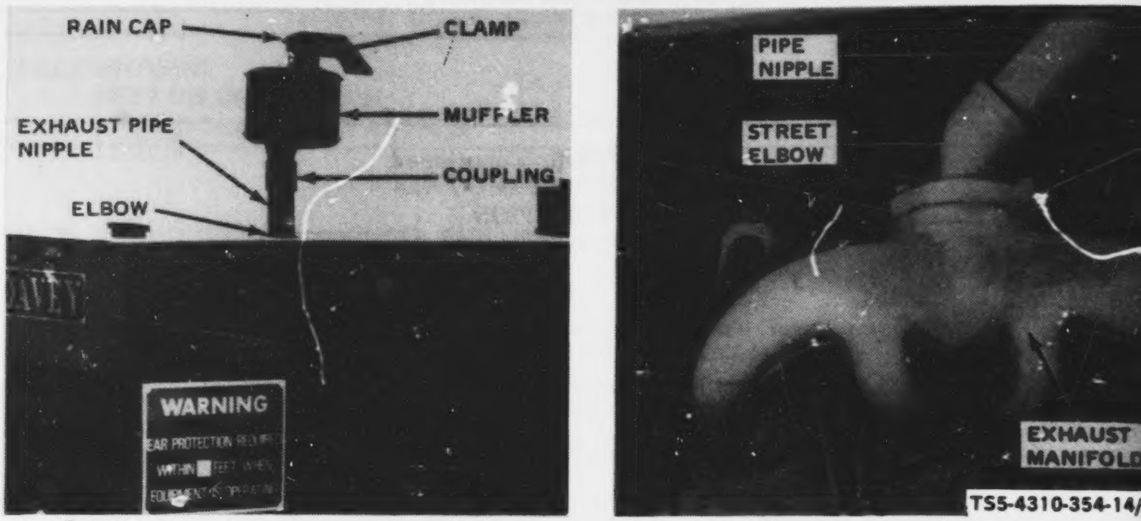


A MUFFLER AND EXHAUST EXTENSION

B EXHAUST MANIFOLD

REMOVAL

STEP 1. LOOSEN NUT ON RAIN CAP CLAMP, TAP RAIN CAP WITH A HAMMER AND REMOVE RAIN CAP FROM MUFFLER.

STEP 2. UNSCREW AND REMOVE MUFFLER FROM EXHAUST PIPING COUPLING.

STEP 3. AS NECESSARY, UNSCREW AND REMOVE PIPE COUPLING, NIPPLE, ELBOW, NIPPLE, AND STREET ELBOW FROM ENGINE EXHAUST MANIFOLD.

INSTALLATION

STEP 1. AS NECESSARY, INSTALL STREET ELB
IN ENGINE EXHAUST MANIFOLD,INSTA
PIPE NIPPLE, ELBOW,NIPPLE, AND CO
LING.

STEP 2. INSTALL EXHAUST MUFFLER IN CO
LING.

STEP 3. INSTALL RAIN CAP ON MUFFLER A
TIGHTEN CLAMP NUT.

Figure 4-9. Exhaust muffler group, removal and installation.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-138°F (38°C-59°C).

b. Cleaning and Inspection.

(1) Use a wire brush to remove all scale depo
and carbon. After brushing, clean part
cleaning solvent, Federal Specificat
P-D-680, Type II.

(2) Inspect parts for cracks, breaks, or any ot
defects.

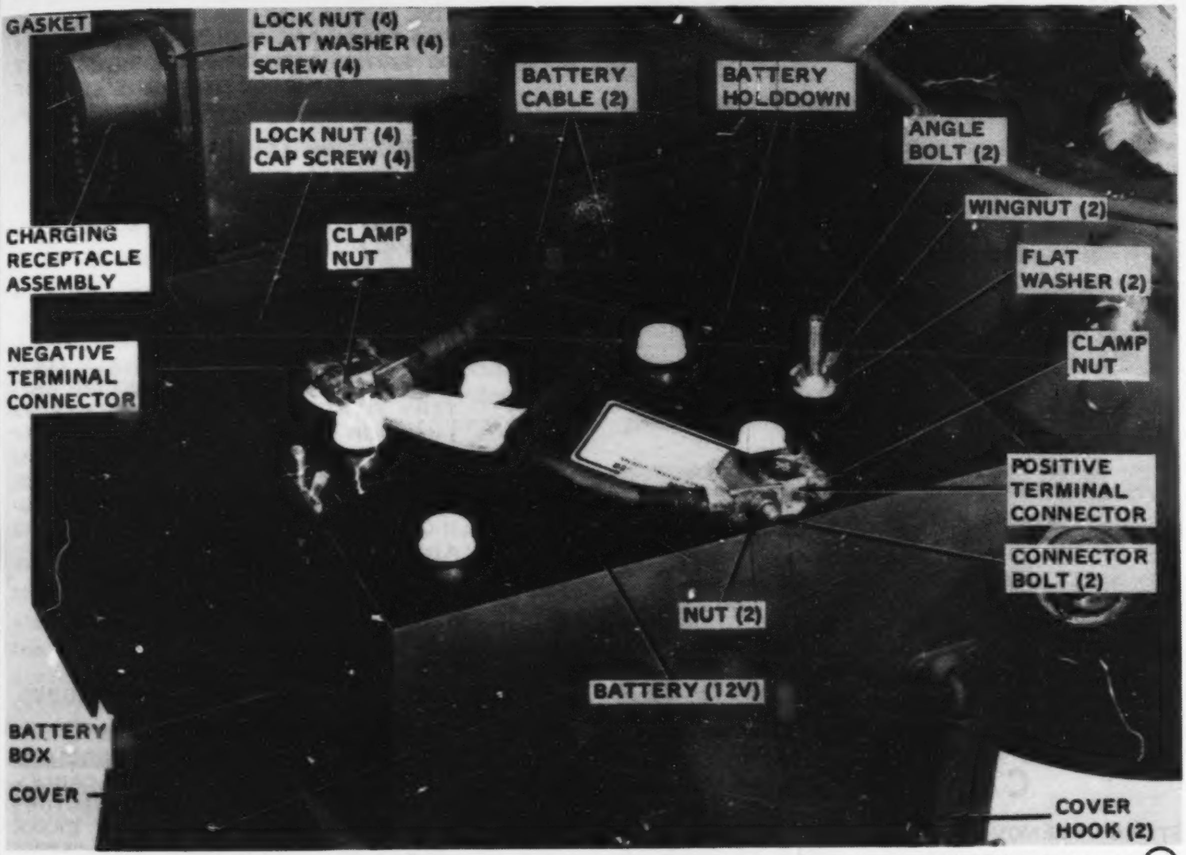
c. Installation. Install the exhaust muffler
shown in figure 4-9.

Section VIII. MAINTENANCE OF BATTERY BOX GROUP

4-22. General. The battery box group consists of the sheet metal battery box with cover, the 12-volt battery, battery holddown, battery cables and terminals, and the battery charging slave receptacle. The battery box is attached to the unit frame on the air end of the unit next to the oil separator assembly.

4-23. Battery Box Group.

a. Removal and Disassembly. Unhook and remove the battery box cover to gain access to battery and group components. Remove and disassemble as shown in figure 4-10.


GASKET
LOCK NUT (4)
FLAT WASHER (4)
SCREW (4)
BATTERY CABLE (2)
BATTERY HOLDDOWN
ANGLE BOLT (2)
LOCK NUT (4)
CAP SCREW (4)
WINGNUT (2)
CHARGING RECEPTACLE ASSEMBLY
CLAMP NUT
FLAT WASHER (2)
NEGATIVE TERMINAL CONNECTOR
CLAMP NUT
POSITIVE TERMINAL CONNECTOR
CONNECTOR BOLT (2)
NUT (2)
BATTERY (12V)
BATTERY BOX
COVER
COVER HOOK (2)

A BATTERY AND BATTERY BOX

TS5-4310-354-14/4-10 ①

REMOVAL

STEP 1. UNHOOK AND REMOVE BATTERY BOX COVER. LOOSEN CLAMP NUT ON NEGATIVE AND POSITIVE BATTERY TERMINALS. DISCONNECT THE TERMINAL CONNECTORS FROM THE BATTERY TERMINALS.

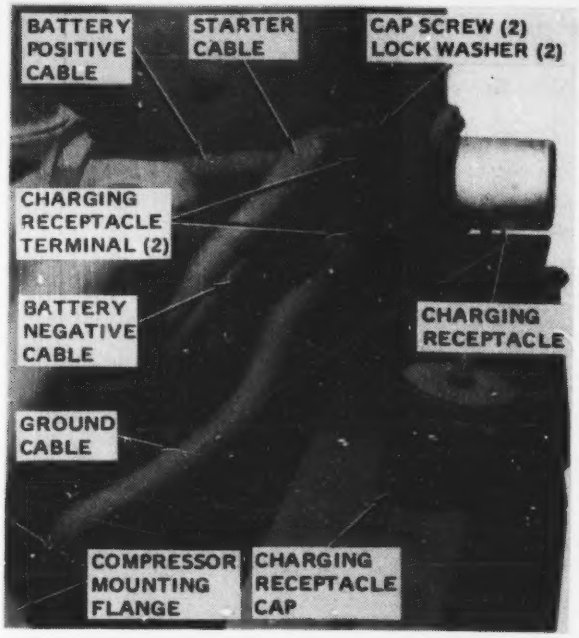
STEP 2. REMOVE THE WINGNUTS, FLAT WASHERS, ANGLE BOLTS, AND BATTERY HOLDDOWN. CAREFULLY LIFT BATTERY FROM BOX.

STEP 3. REMOVE NUTS THAT SECURE TERMINAL CONNECTORS TO BATTERY CABLES; DISCONNECT CABLE FROM CONNECTOR AND REINSTALL NUT ON CONNECTOR BOLT.

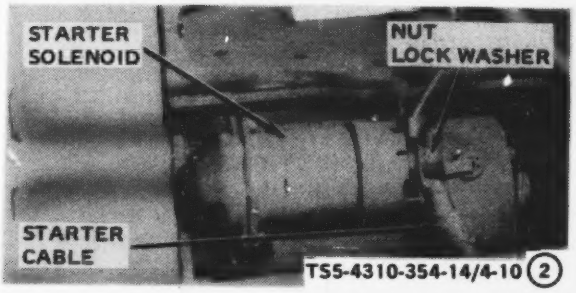
STEP 4. REMOVE CAP SCREWS AND LOCK WASHERS FROM THE TWO CHARGING RECEPTACLE CABLE TERMINALS TO DISCONNECT THE FOUR CABLES. REINSTALL THE LOCK WASHER AND CAP SCREWS IN THE CHARGING RECEPTACLE TO PREVENT THEIR LOSS.

STEP 5. PULL THE BATTERY NEGATIVE AND POSITIVE CABLES THROUGH BATTERY BOX. REMOVE CAP SCREW AND LOCK WASHER THAT ATTACH RECEPTACLE GROUND CABLE TO COMPRESSOR MOUNTING FLANGE AND REMOVE THE GROUND CABLE. REINSTALL CAP SCREW AND LOCK WASHER IN COMPRESSOR MOUNTING FLANGE TO PREVENT THEIR LOSS.

Figure 4-10. Battery box group, removal and installation (sheet 1 of 2).


BATTERY POSITIVE CABLE
STARTER CABLE
CAP SCREW (2) LOCK WASHER (2)
CHARGING RECEPTACLE TERMINAL (2)
BATTERY NEGATIVE CABLE
CHARGING RECEPTACLE
GROUND CABLE
COMPRESSOR MOUNTING FLANGE
CHARGING RECEPTACLE CAP

B CHARGING RECEPTABLE


STARTER SOLENOID
NUT LOCK WASHER
STARTER CABLE
TS5-4310-354-14/4-10 ②

C STARTING MOTOR

STEP 6. REMOVE NUT AND LOCK WASHER THAT ATTACH STARTER CABLE TO STARTER SOLENOID. REMOVE THE STARTER CABLE AND REINSTALL LOCK WASHER AND NUT ON SOLENOID TERMINAL TO PREVENT THEIR LOSS.

STEP 7. REMOVE FOUR LOCK NUTS, FLAT WASHERS, AND SCREWS THAT ATTACH THE CHARGING RECEPTACLE TO HOUSING END PANEL. REMOVE THE RECEPTACLE WITH CAP AND CHAIN, GASKET, AND INSULATOR.

STEP 8. REMOVE FOUR LOCKNUTS AND CAP SCREWS THAT ATTACH BATTERY BOX TO FRAME AND REMOVE THE BATTERY BOX.

INSTALLATION

STEP 1. INSTALL BATTERY BOX IN POSITION C
SKID AGAINST FRAME AND ATTACH T
FRAME WITH FOUR CAP SCREWS AN
LOCKNUTS.

STEP 2. INSTALL CHARGING RECEPTACLE GAS
KET IN POSITION ON OUTSIDE OF HOU
ING END PANEL. INSTALL CHARGING R
CEPTACLE WITH POSITIVE TERMINAL C
TOP. INSTALL INSULATOR ON INSIDE C
END PANEL AND SECURE THE ASSEMBL
TO PANEL WITH FOUR SCREWS, FLA
WASHERS, AND LOCKNUTS WITH ONE C
THE SCREWS ATTACHING THE CAP CHAI

STEP 3. REMOVE NUT AND LOCK WASHER FRO
STARTER CABLE TERMINAL ON STARTE
SOLENOID. INSTALL STARTER CABLE O
TERMINAL AND REINSTALL LOCK WAS
ER AND NUT.

STEP 4. REMOVE CAP SCREW AND LOCK WASHE
FROM COMPRESSOR MOUNTING FLANG
INSTALL CHARGING RECEPTACL
GROUND CABLE AND REINSTALL LOC
WASHER AND CAP SCREW. RUN THE BA
TERY POSITIVE AND NEGATIVE CABLE
THROUGH BATTERY BOX, REMOVE CA
SCREWS AND LOCK WASHERS FRO
CHARGING RECEPTACLE TERMINAL
CONNECT THE FOUR CABLES TO CHAR
ING RECEPTACLE WITH LOCK WASHER
AND CAP SCREWS JUST REMOVED. (R
FER TO WIRING DIAGRAM, FIG 1-3.)

NOTE

UNIT ELECTRICAL SYSTEM IS NEGATIVE GROUN

STEP 5. INSTALL BATTERY CABLE CONNECTOR
TO NEGATIVE AND POSITIVE CABLE
MAKE CERTAIN THAT THE CONNECTOR
ARE INSTALLED ON CORRECT CABL
(NEGATIVE CONNECTOR ON NEGATIV
CABLE).

STEP 6. CAREFULLY INSTALL BATTERY IN BOX
POSITION HOLDDOWN OVER BATTER
AND SECURE WITH ANGLE BOLTS, FLA
WASHERS, AND WINGNUTS.

STEP 7. CONNECT THE BATTERY CABLE CONNEC
TORS TO THE BATTERY TERMINALS AND
TIGHTEN SECURELY. MAKE CERTAI
CONNECTIONS ARE CORRECT.

STEP 8. REFER TO FIG 3-10 AND SERVICE THE BAT
TERY AS NECESSARY. INSTALL THE BAT
TERY BOX COVER.

Figure 4-10. Battery box group, removal and installation (sheet 2 of 2)

b. Cleaning and Inspection. Refer to figure 3-18 and clean and inspect the battery. Clean and inspect the other battery box group component as follows:

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

(1) *Battery cables and charging receptacle cables.* Wipe the cables with a clean cloth moistened with solvent, Federal Specification P-D-680, Type II, and dry thoroughly. Inspect the cables for damaged or cut insulation and cable terminals for evidence of burning and tightness of connection.

(2) *Charging receptacle.* Clean the charging receptacle by wiping with a clean, dry cloth. Inspect lead terminals for corrosion, distortion, or any other defect. Inspect tne body and cover for cracks, breaks, or other damage. Replace a defective charging receptacle.

(3) *Battery holddown, cover, and battery box.* Clean these parts with water and a solution of sodium bicarbonate; then rinse thoroughly. Inspect for cracks, breaks, distortion, or any other damage. Check specific gravity of the battery electrolyte with a hydrometer. Specific gravity will be 1.250 or higher.

c. Repair. Repair the battery box, cover, and battery holddown by straightening any dents or deformation and by welding any breaks.

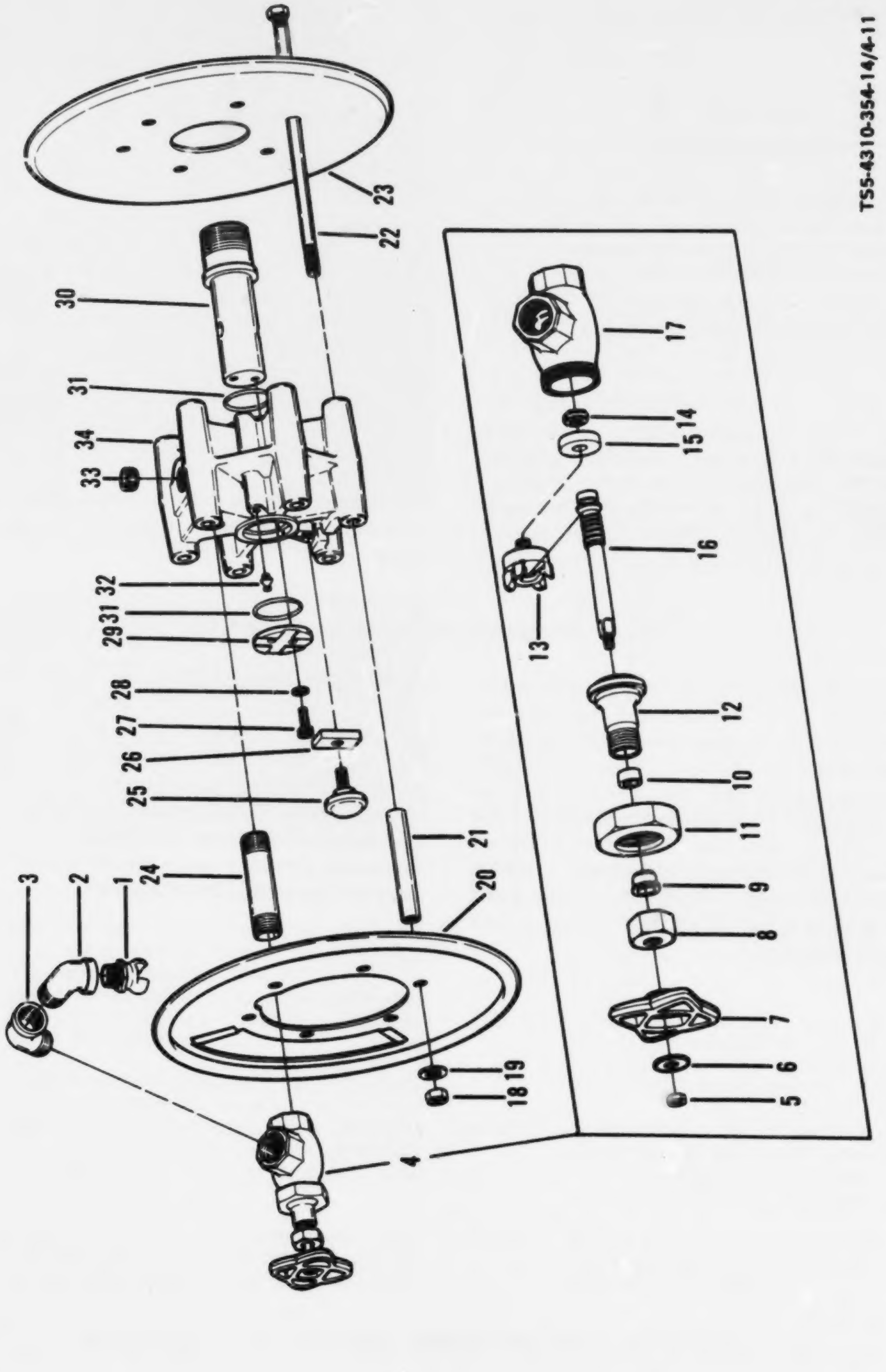
d. Reassembly and Installation. Refer to figure 4-10 and reassemble and install the battery box group.

Section IX. MAINTENANCE OF HOSE AND HOSE REEL

4-24. General. The hose and hose reel group consists of the service air hose assembly and the hose reel assembly. The service air hose assembly is coiled on the hose reel assembly and is equipped with quick-disconnect couplings on each end. The hose reel assembly is mounted on the discharge opening of the minimum pressure valve assembly on top of the oil separator assembly. The hose reel is equipped with a locking device to prevent the hose from unreeling and also a shutoff valve to control air flow through the air service hose assembly.

4-25. Hose and Hose Reel.

a. Removal. Unscrew the hose reel braking knob (25, figure 4-11) and unreel the air service hose assembly off the reel. Disconnect and remove the hose assembly from the reel hose end (1). Unscrew the hose reel spindle (30) from the discharge opening of the minimum pressure valve assembly and remove the hose reel assembly from the unit.


TS5-4310-354-14/4-11

KEY to figure 4-11:

1. Hose end
2. Street elbow, 90°
3. Street elbow, 45°
4. Angle valve
5. Nut
6. Ident plate
7. Handwheel
8. Packing nut
9. Packing gland
10. Packing
11. Union nut
12. Bonnet
13. Disc holder
14. Nut
15. Disc
16. Stem
17. Valve body
18. Nut (6)
19. Lock washer (6)
20. Reel end
21. Spacer (6)
22. Tie rod (6)
23. Reel end
24. Nipple
25. Brake knob
26. Brake block
27. Cap screw (2)
28. Lock washer (2)
29. Retainer
30. Spindle
31. O-ring (2)
32. Lube fitting
33. Pipe plug
34. Body

b. Disassembly. Disassemble the hose reel assembly in the numerical sequence shown in figure 4-11 as follows:

(1) Unscrew and remove hose end (1), street elbows (2, 3), and angle valve (4). When disassembly of angle valve (4) is necessary, unscrew and remove nut (5), identification plate (6), and handwheel (7). Remove packing nut (8), packing gland (9), and packing (10). Remove union nut (11) and bonnet (12) from valve body (17). Remove stem (16) from valve body (17) and remove disc holder (13) from stem (16). Remove nut (14) and disc (15) from disc holder (13).

(2) Remove the six nuts (18) and lock washers (19). Remove reel end (20), six spacers (21) and tie rods (22), and reel end (23).

(3) Unscrew and remove nipple (24). Remove brake knob (25) and brake block (26). Unscrew and remove two cap screws (27) and lock washers (28); remove retainer (29).

(4) Withdraw spindle (30) from body (34) using a twisting motion. Remove two o-rings (31), lube fitting (32), and pipe plug (33) from body (34).

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

c. Cleaning and Inspection. Clean all metal parts with solvent, Federal Specification P-D-680, Type II. Wipe air service hose clean with cloth moistened with the solvent. Inspect all parts for cracks, breaks, damaged threads, and distortion. Check shutoff valve for proper operation and seating of valve. Inspect hose assembly for any cuts and breaks.

d. Repair. Straighten any distortion of hose reel ends. Remove any nicks and burrs from spindle with a fine crocus cloth. Replace o-rings at each disassembly. Replace all defective parts.

e. Reassembly. Reassemble the hose reel assembly in the reverse sequence of index numbers shown in figure 4-11 as follows:

(1) Install pipe plug (33) and lube fitting (32) in body (34). Apply a light coating of clean lubricating oil or petroleum jelly on the two o-rings (31) and assemble in body (34). Using a twisting motion, assemble spindle (30) into body (34) being careful not to damage o-rings (31).

(2) Assemble retainer (29) on the end of spindle (30) with two lock washers (28) and cap screws (27). Assemble brake block (26) onto body (34) with brake knob (25). Assemble brake block (26) in one of the slots of retainer (29). Install nipple (24) in body (34).

(3) Assemble reel end (23) on body (34) with six tie rods (22). Slide six spacers (21) onto tie rods (22), assemble reel end (20) on tie rods (22) with clearance cutout in center bore of reel end over nipple (24). Secure reel end (20) on tie rods (22) with six lock washers (19) and nuts (18).

(4) Assemble disc (15) on threaded stem of disc holder (13) and secure with nut (14). As-

semble disc holder (13) on stem (16). Assemble stem (16) into valve body (17), assemble bonnet (12) over stem (16) and install union nut (11). Assemble packing (10), packing gland (9), and packing nut (8). Place handwheel (7) and identification plate (6) on stem (16) and secure with nut (5). Assemble the angle valve (4) onto nipple (24), install two street elbows (3, 2) in angle valve (4). Install hose end (1) in street elbow (2).

f. Testing. After hose reel is reassembled, test for leaks as follows:

(1) Close the angle valve (4, figure 4-11) by turning handwheel clockwise. Attach spindle (30) to an air source capable of producing 100 psi air pressure.

(2) Apply this air pressure of 100 psi to the hose reel assembly. Check for leaking around the spindle (30) and body (34), at connection of nipple (24) and body (34), and connection of nipple (24) and valve (4). Check valve (4) for leaking. Leakage check can be accomplished by applying a soapy water solution applied with a brush to these connections. Leakage will be indicated by bubbling of the solution.

(3) If leakage occurs, the hose reel must be disassembled, cleaned, inspected, repaired, reassembled, and retested. Relieve the test pressure and remove the hose reel assembly from the test air source.

g. Installation. Install the hose reel assembly by screwing spindle (30, figure 4-11) into discharge opening of non return valve assembly on oil separator assembly. Place one end of air service hose assembly through opening in reel end, connect to hose end (1) on reel, wind the hose on the reel and lock with braking knob (25).

Section X. MAINTENANCE OF COMPRESSOR ENCLOSURE GROUP

4-26. General. The engine, air compressor, radiator and oil cooler assembly, and instrument panel are housed in a sheet metal enclosure. Doors on both sides of the unit provide access to these components. In addition to the doors, the enclosure consists of an end cover access panel, end panel, exhaust deflector, and roof section. The data and instruction plates attach to the outside of the enclosure.

4-27. Compressor Enclosure.

a. Removal and Disassembly.

(1) Remove the exterior components to gain access to compressor enclosure as shown in figure 4-12.

(2) Remove the charging receptacle from end panel as shown in figure 4-10, removal step 4 and step 7.

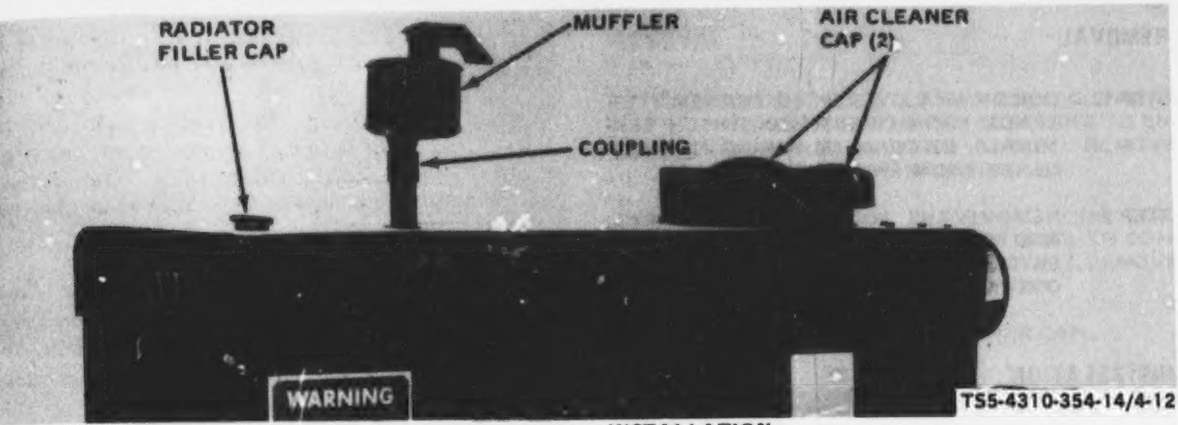
(3) Remove the quick start assembly from end panel as shown in figure 4-13.

(4) Remove the engine overspeed shutdown switch as shown in figure 4-14.

(5) Remove the engine and compressor air cleaner assemblies as shown in figure 4-15.

(6) Remove the data and instruction plates as shown in figure 4-16.

(7) Disconnect the two oil separator hose assemblies (figure 4-22, step 1).


RADIATOR FILLER CAP
MUFFLER
AIR CLEANER CAP (2)
COUPLING
WARNING
TS5-4310-354-14/4-12

REMOVAL

STEP 1. REMOVE THE RADIATOR FILLER CAP.

STEP 2. UNSCREW AND REMOVE THE MUFFLER AT THE EXHAUST PIPING COUPLING.

STEP 3. REMOVE THE TWO AIR CLEANER CAPS.

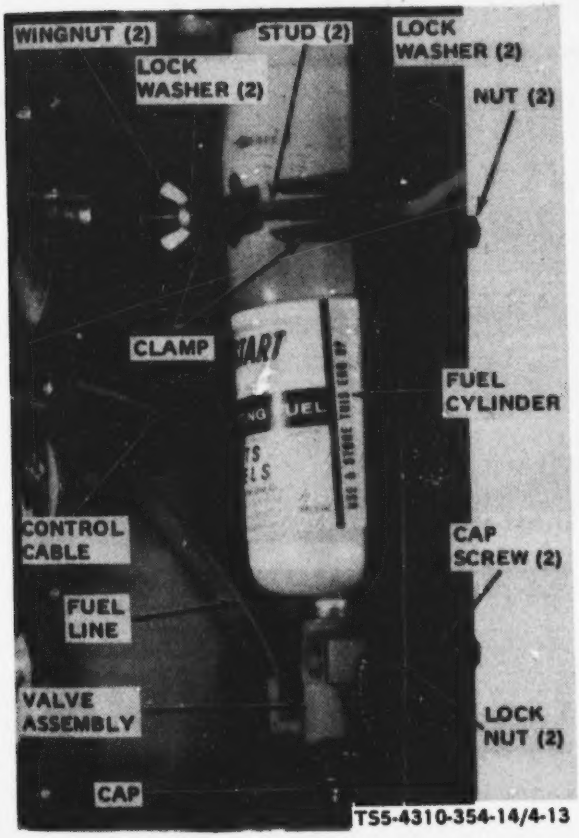
INSTALLATION

STEP 1. INSTALL THE TWO AIR CLEANER CAPS.

STEP 2. INSTALL THE MUFFLER IN EXHAUST PIPING COUPLING.

STEP 3. INSTALL THE RADIATOR FILLER CAP.

Figure 4-12. Exterior components on compressor enclosure, removal and installation.


WINGNUT (2)
STUD (2)
LOCK WASHER (2)
LOCK WASHER (2)
NUT (2)
CLAMP
FUEL CYLINDER
CONTROL CABLE
CAP SCREW (2)
FUEL LINE
VALVE ASSEMBLY
LOCK NUT (2)
CAP
TS5-4310-354-14/4-13

REMOVAL

STEP 1. REFER TO FIG 3-14 AND REMOVE FUEL CYLINDER. INSTALL VALVE CAP TO PREVENT DIRT FROM ENTERING VALVE UNTIL FUEL CYLINDER IS AGAIN INSTALLED.

STEP 2. REMOVE CYLINDER CLAMP STUDS FROM END PANEL. DISCONNECT QUICK-START CABLE FROM VALVE LEVER AND CABLE CLAMP. DISCONNECT FUEL LINE FROM VALVE.

STEP 3. REMOVE LOCK NUTS AND CAP SCREWS THAT SECURE VALVE TO END PANEL AND REMOVE THE VALVE ASSEMBLY.

INSTALLATION

STEP 1. INSTALL VALVE ASSEMBLY ON END PANEL AND SECURE WITH CAP SCREWS AND LOCK NUTS.

STEP 2. CONNECT FUEL LINE TO VALVE. CONNECT QUICK-START CABLE THROUGH CABLE CLAMP ON VALVE AND ATTACH TO VALVE LEVER. TIGHTEN CLAMP. INSTALL FUEL CYLINDER CLAMP STUDS TO END PANEL.

STEP 3. REMOVE CAP FROM VALVE AND INSTALL FUEL CYLINDER. TIGHTEN FUEL CYLINDER HAND TIGHT ONLY (FIG 3-14).

Figure 4-13. Quick start assembly, removal and installation.

REMOVAL

STEP 1. DISCONNECT OVERSPEED TRANSMITTER LEADS FROM OVERSPEED SWITCH TERMINALS. DISCONNECT WIRING HARNESS LEADS FROM SWITCH TERMINALS.

STEP 2. REMOVE THE LOCKNUTS, CAP SCREWS, AND RUBBER WASHERS THAT SECURE SWITCH TO END PANEL AND REMOVE THE OVERSPEED SWITCH.

INSTALLATION

STEP 1. INSTALL THE OVERSPEED SWITCH ON END PANEL WITH GROUND WIRE ATTACHED TO ONE MOUNTING SCREW. ATTACH SWITCH WITH CAP SCREWS, RUBBER WASHERS BETWEEN SWITCH AND END PANEL, AND LOCKNUTS.

STEP 2. CONNECT WIRING HARNESS LEADS AND OVERSPEED TRANSMITTER LEADS TO SWITCH TERMINALS. REFER TO FIG 1-3 FOR WIRING DIAGRAM.

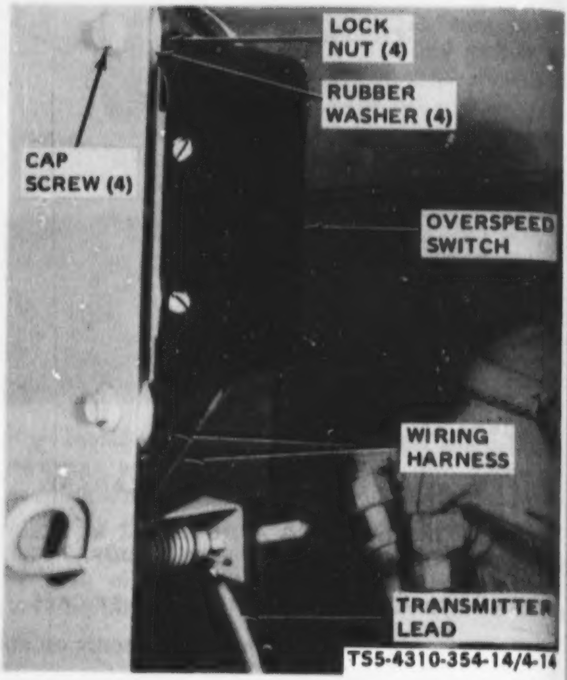
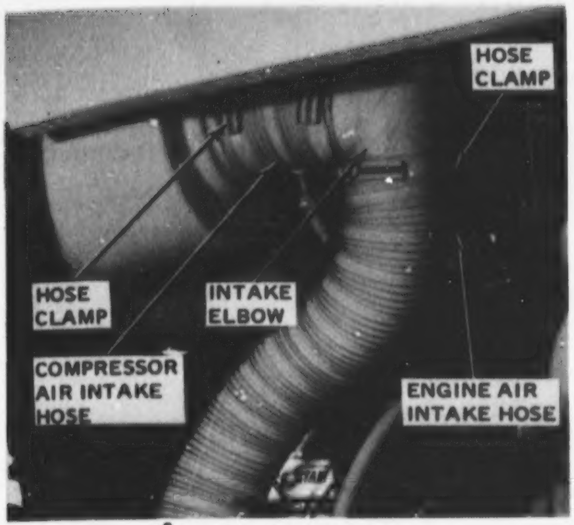
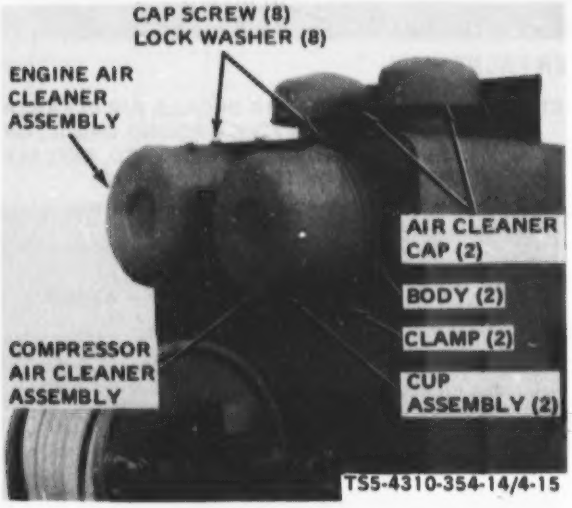

LOCK NUT (4)
RUBBER WASHER (4)
CAP SCREW (4)
OVERSPEED SWITCH
WIRING HARNESS
TRANSMITTER LEAD
TS5-4310-354-14/4-14

Figure 4-14. Engine overspeed shutdown switch, removal and installation.


HOSE CLAMP
HOSE CLAMP
INTAKE ELBOW
COMPRESSOR AIR INTAKE HOSE
ENGINE AIR INTAKE HOSE

A AIR INTAKE HOSE


CAP SCREW (8)
LOCK WASHER (8)
ENGINE AIR CLEANER ASSEMBLY
AIR CLEANER CAP (2)
BODY (2)
CLAMP (2)
CUP ASSEMBLY (2)
COMPRESSOR AIR CLEANER ASSEMBLY
TS5-4310-354-14/4-15

B AIR CLEANERS

REMOVAL

STEP 1. LOOSEN HOSE CLAMP SECURING ENGINE AIR INTAKE ADAPTER TUBE HOSE TO ENGINE AIR CLEANER OUTLET. REMOVE THE HOSE FROM THE OUTLET.

STEP 2. LOOSEN HOSE CLAMP SECURING COMPRESSOR INTAKE ELBOW HOSE TO COMPRESSOR AIR CLEANER OUTLET. REMOVE THE HOSE FROM THE OUTLET.

STEP 3. REMOVE THE AIR CLEANER CAPS.

STEP 4. LOOSEN CLAMP THAT SECURES AIR CLEANER CUP ASSEMBLY TO BODY. REMOVE CUP ASSEMBLY AND CLAMP.

STEP 5. REMOVE FOUR ATTACHING CAP SCREWS AND LOCK WASHERS FROM EACH OF THE TWO AIR CLEANER ASSEMBLIES AND REMOVE THE AIR CLEANERS FROM THE UNIT.

INSTALLATION

NOTE

THE ENGINE AND COMPRESSOR AIR CLEANER ASSEMBLIES ARE IDENTICAL AND NEED NOT BE INSTALLED FOR SAME COMPONENT AS REMOVED. THE ASSEMBLIES ARE INTERCHANGEABLE.

STEP 1. POSITION EACH AIR CLEANER ASSEMBLY UNDER THE ROOF SECTION WITH INLET TUBE OF AIR CLEANER THROUGH HOLE IN ROOF. ATTACH EACH ASSEMBLY WITH FOUR LOCK WASHERS AND CAP SCREWS.

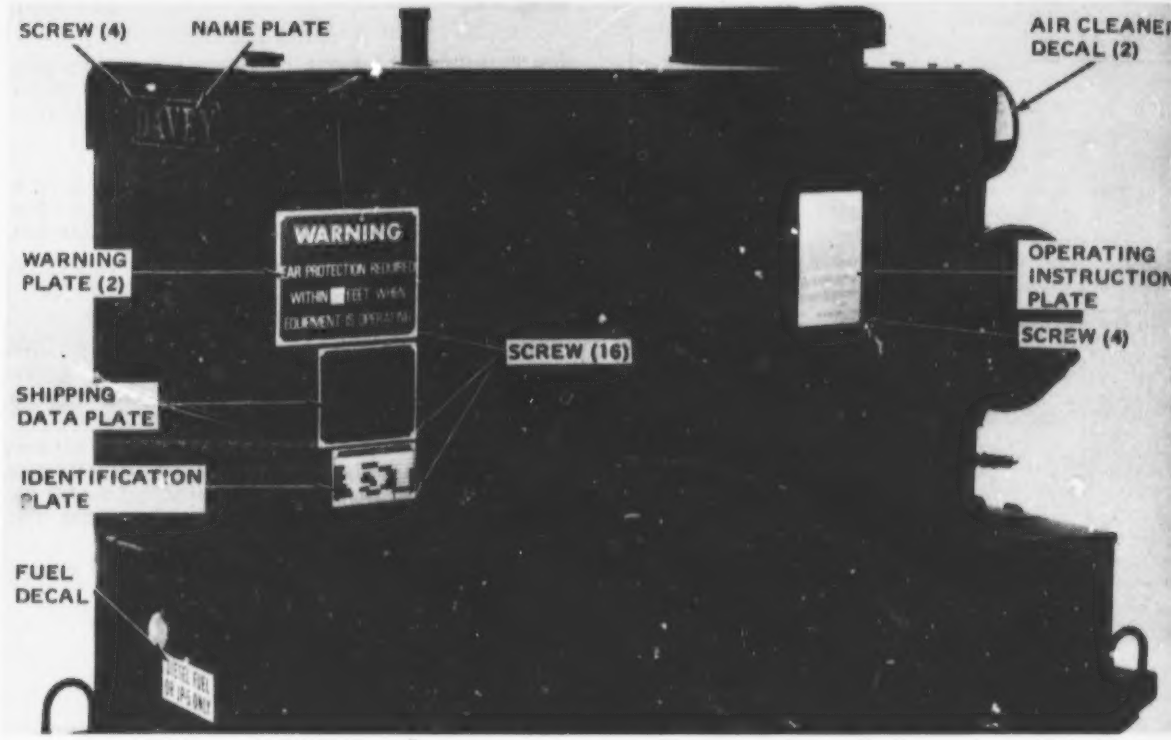
STEP 2. INSTALL AIR CLEANER CUP ASSEMBLY ON BODY WITH INSTALLATION ARROWS POINTING UPWARD. SECURE CUP ASSEMBLY ON BODY WITH CLAMP. TIGHTEN CLAMP.

STEP 3. INSTALL THE AIR CLEANER CAPS.

STEP 4. INSTALL COMPRESSOR INTAKE ELBOW HOSE ON COMPRESSOR AIR CLEANER OUTLET AND SECURE WITH HOSE CLAMP.

STEP 5. INSTALL ENGINE AIR INTAKE ADAPTER TUBE HOSE ON ENGINE AIR CLEANER OUTLET AND SECURE WITH HOSE CLAMP.

Figure 4-15. Engine and compressor air cleaner assemblies, removal and installation.


SCREW (4)
NAME PLATE
AIR CLEANE
DECAL (2)
WARNING
EAR PROTECTION REQUIRED
WITHIN FEET WHEN
EQUIPMENT IS OPERATING
WARNING
PLATE (2)
OPERATING
INSTRUCTIO
PLATE
SCREW (4)
SCREW (16)
SHIPPING
DATA PLATE
IDENTIFICATION
PLATE
FUEL
DECAL
DIESEL FUEL
OR JP5 ONLY

A THREE-QUARTER FRONT VIEW

REMOVAL

STEP 1. AS NECESSARY, REMOVE SELF-TAPPING SCREWS AND NAME PLATE. FUEL DECAL NEED NOT BE REMOVED EXCEPT FOR REPLACEMENT.

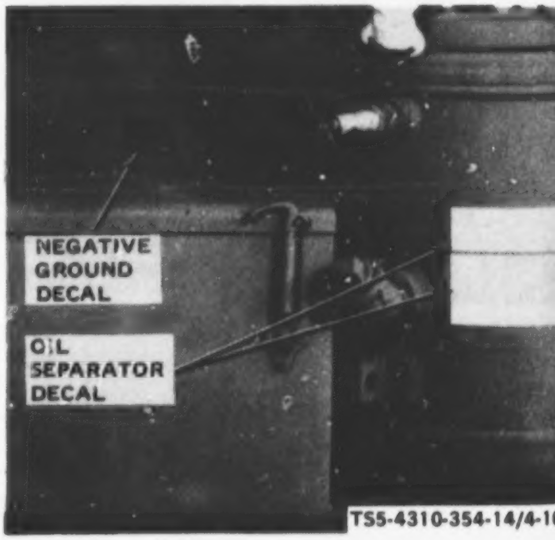
STEP 2. THE NEGATIVE GROUND DECAL, AIR CLEANER DECAL, AND OIL SEPARATOR DECALS NEED NOT BE REMOVED EXCEPT FOR REPLACEMENT.

STEP 3. AS NECESSARY, REMOVE THE SELF-TAPPING SCREWS AND REMOVE IDENTIFICATION PLATE, SHIPPING DATA PLATE, WARNING PLATE (ONE EACH SIDE OF UNIT), AND OPERATING INSTRUCTION PLATE.

INSTALLATION

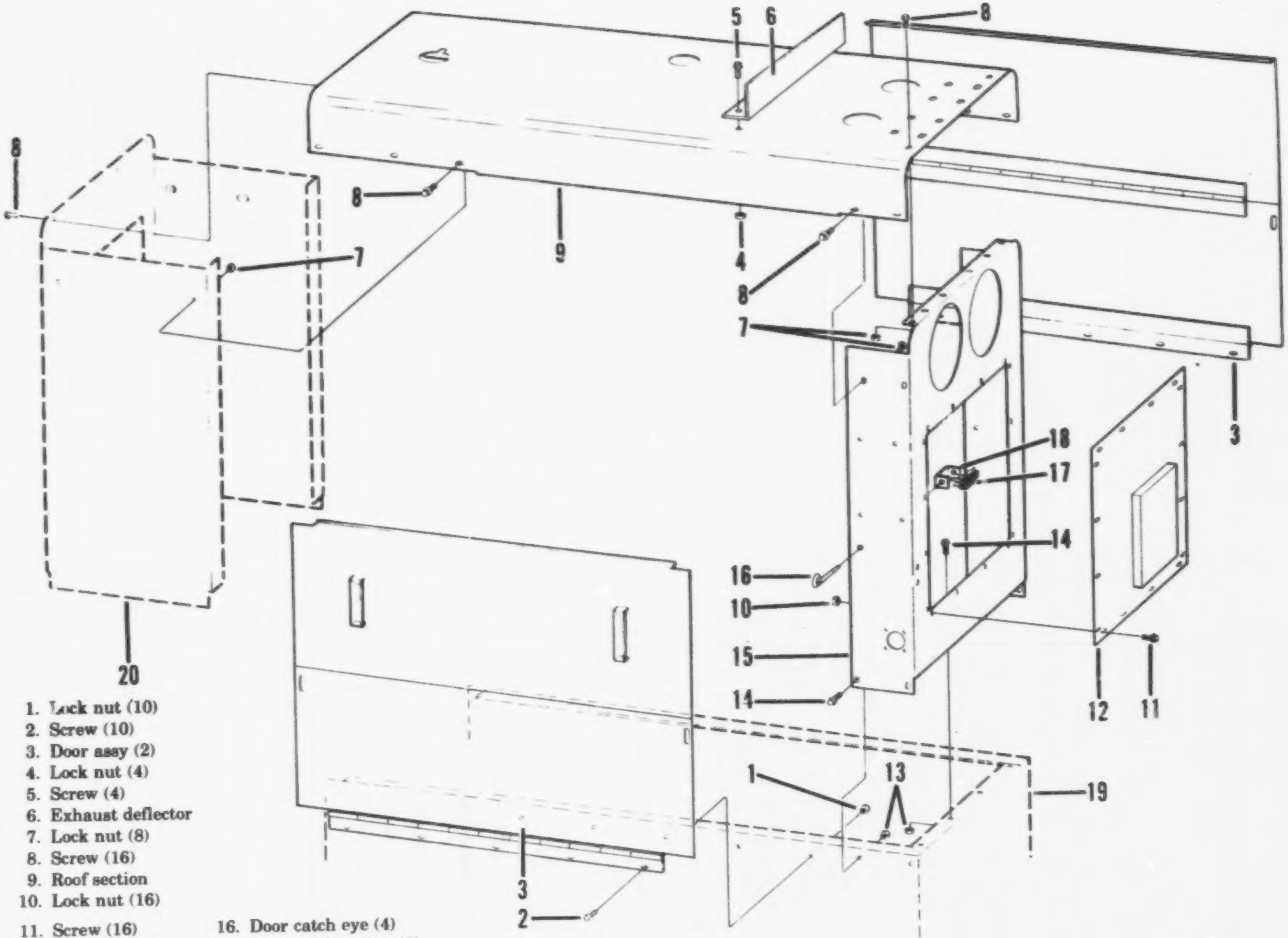
STEP 1. AS NECESSARY, INSTALL THE OPERATING INSTRUCTION PLATE, TWO WARNING PLATES (ONE EACH SIDE OF UNIT), SHIPPING DATA PLATE, IDENTIFICATION PLATE, AND NAME PLATE USING FOUR SELF-TAPPING SCREWS EACH.

STEP 2. IF OIL SEPARATOR DECALS, AIR CLEANE DECALS, NEGATIVE GROUND DECAL, O FUEL DECAL WHERE REMOVED, REPLAC WITH NEW ONES AS NECESSARY.


NEGATIVE
GROUND
DECAL
OIL
SEPARATOR
DECAL
TS5-4310-354-14/4-1

B FULL REAR VIEW

Figure 4-16. Data and instruction plates, removal installation.


5
6
8
8
8
9
4
8
7
7
3
18
17
14
16
10
15
14
12
11
20
1
13
19
3
2

1. Lock nut (10)
2. Screw (10)
3. Door assy (2)
4. Lock nut (4)
5. Screw (4)
6. Exhaust deflector
7. Lock nut (8)
8. Screw (16)
9. Roof section
10. Lock nut (16)
11. Screw (16)
12. Access panel
13. Lock nut (8)
14. Screw (8)
15. End panel
16. Door catch eye (4)
17. Door catch spring (4)
18. Door catch bracket (4)
19. Frame (ref)
20. Radiator-cooler assy (ref)

TS5-4310-354-14/4-17

Figure 4-17. Compressor enclosure group, disassembly and reassembly.

(8) Disassemble the compressor enclosure group in the sequence of index numbers shown in figure 4-17 as follows:

(a) Remove ten lock nuts (1) and screws (2), five for each door assembly, and remove the two door assemblies (3). Only when necessary, remove four lock nuts (4) and screws (5), and the exhaust deflector (6).

(b) Remove eight lock nuts (7), sixteen screws (8), and the roof section (9).

(c) Remove sixteen lock nuts (10) and screws (11), and the access panel (12). Remove eight lock nuts (13) and screws (14) and remove the end panel (15).

(d) Hold the straight end portion of door latch spring (17) against leg of bracket (18) with vise-grip type pliers and turn door catch eye (16) in a clockwise direction while pulling outward. Remove the four door catch eyes (16), door catch springs (17) and door catch brackets (18) in this manner. Two are mounted on the end panel (15), one on each side, and two on radiator-cooler assembly (20), one on each side.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. *Cleaning, Inspection, and Repair.*

(1) Clean all enclosure components using solvent, Federal Specification P-D-680, Type II. Dry thoroughly.

(2) Inspect all parts for dents, cracks, breaks, or any other damage. Inspect all hardware for damaged threads, distortion, and missing parts.

(3) Repair of enclosure components is limited straightening of dents, welding of crac and breaks, and replacement of defecti parts.

c. *Reassembly and Installation.*

(1) Reassemble the compressor enclosure grou in the reverse sequence of index numbers i figure 4-17 as follows:

(a) Place door catch spring (17) between th legs of bracket (18) and hold straight en portion of spring (17) against leg o bracket (18) with vise-grip type plier Place bracket (18) in position in line with hole for door catch eye (16) with th larger end of spring (17) toward end pane (15). Insert door catch eye (16) throug hole in end panel (15), through hole i bracket (18), and into spring (17). Use turning motion in counterclockwise direction while pushing in on door catc eye (16) to insert the tapered end of th eye into the small end of the spring (17 Remove the pliers. Assemble all four doo catch eyes in this manner, two on en panel (15) and two on radiator-cooler assembly (20), one on each side.

(b) Place end panel (15) in position on fram (19) and attach with eight screws (14) and lock nuts (13). Assemble access panel (12 onto end panel (15) with sixteen screws (11) and lock nuts (10).

(c) Assemble roof section (9) onto end panel (15) and radiator-cooler assembly (20 with sixteen screws (8) and eight lock nuts (7).

(d) Assemble exhaust deflector (6) onto roof section (9) with upright leg toward the air cleaner end of the unit. Attach exhaust deflector (6) with four screws (5) and lock nuts (4).

(e) Attach the two door assemblies (3) to frame (19), one on each side, with ten screws (2) and lock nuts (1), five screws and lock nuts for each door.

(2) Install data and instructions plates as shown in figure 4-16.

(3) Install the engine and compressor air cleaner assemblies as shown in figure 4-15.

(4) Install the engine overspeed shutdown switch as shown in figure 4-14.

(5) Install the quick start assembly as shown in figure 4-13.

(6) Install the charging receptacle on end panel as shown in figure 4-10, installation step 2 and step 4.

(7) Install the two oil separator hose assemblies (figure 4-22, step 5).

(8) Install the exterior components on compressor enclosure as shown in figure 4-12.

Section XI. MAINTENANCE OF RADIATOR AND OIL COOLER GROUP

4-28. General. The radiator and oil cooler group consists of the subassembly of the radiator, compressor oil cooler, fan shroud and guard, radiator guard, and end panel. The subassembly is located on the engine end of the unit.

4-29. Radiator and Oil Cooler Group.

a. Removal. Remove the radiator cap, open radiator drain cock and drain coolant from radiator. Open the two side doors and disconnect the oil hose assemblies from inlet and outlet elbows on the bottom of the oil cooler.

(1) Refer to figure 4-12 and remove the exterior components on compressor enclosure.

(2) Refer to figure 4-15 and remove the engine and compressor air cleaner assemblies.

(3) Refer to figure 4-17 and remove the roof section of the compressor enclosure group.

(4) Refer to figure 4-18 and remove the radiator and oil cooler group.

REMOVAL

STEP 1. LOOSEN HOSE CLAMPS, DISCONNECT, AND REMOVE UPPER RADIATOR HOSE. LOOSEN HOSE CLAMPS, DISCONNECT, AND REMOVE LOWER RADIATOR HOSE.

STEP 2. REMOVE CAP SCREWS, LOCK WASHERS, SPECIAL FLAT WASHERS, RUBBER WASHERS, AND FAN GUARD.

STEP 3. ATTACH A SUITABLE LIFTING DEVICE, SUCH AS A CHAIN HOIST, TO THE RADIATOR AND OIL COOLER ASSEMBLY.

STEP 4. REMOVE LOCKNUTS AND CAP SCREWS THAT ATTACH RADIATOR AND OIL COOLER ASSEMBLY TO THE FRAME. USING THE LIFTING DEVICE, LIFT THE ASSEMBLY OFF THE UNIT AND PLACE IN DISASSEMBLY WORK AREA.

INSTALLATION

STEP 1. AFTER ASSEMBLY OF RADIATOR AND OIL COOLER (FIG 4-19), USE A SUITABLE LIFTING DEVICE AND PLACE THE ASSEMBLY IN POSITION ON UNIT FRAME. ATTACH THE ASSEMBLY WITH CAP SCREWS AND LOCKNUTS. REMOVE THE LIFTING DEVICE.

STEP 2. ATTACH FAN GUARD TO SHROUD WITH RUBBER WASHERS, SPECIAL FLAT WASHERS, LOCK WASHERS, AND CAP SCREWS.

STEP 3. INSTALL LOWER RADIATOR HOSE AND SECURE WITH HOSE CLAMPS. INSTALL UPPER RADIATOR HOSE AND SECURE WITH HOSE CLAMPS.

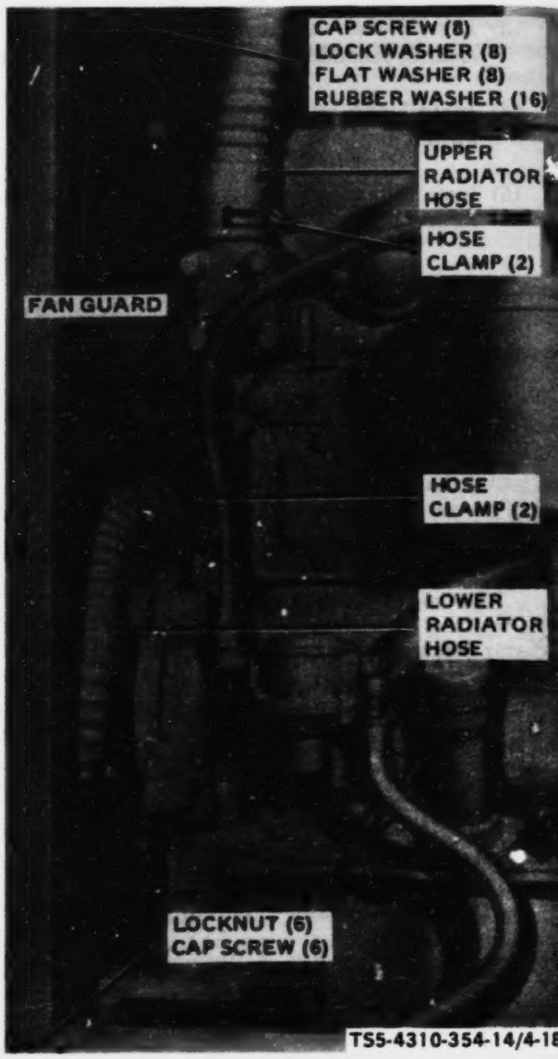


Figure 4-18. Radiator and oil cooler group, removal and installation.

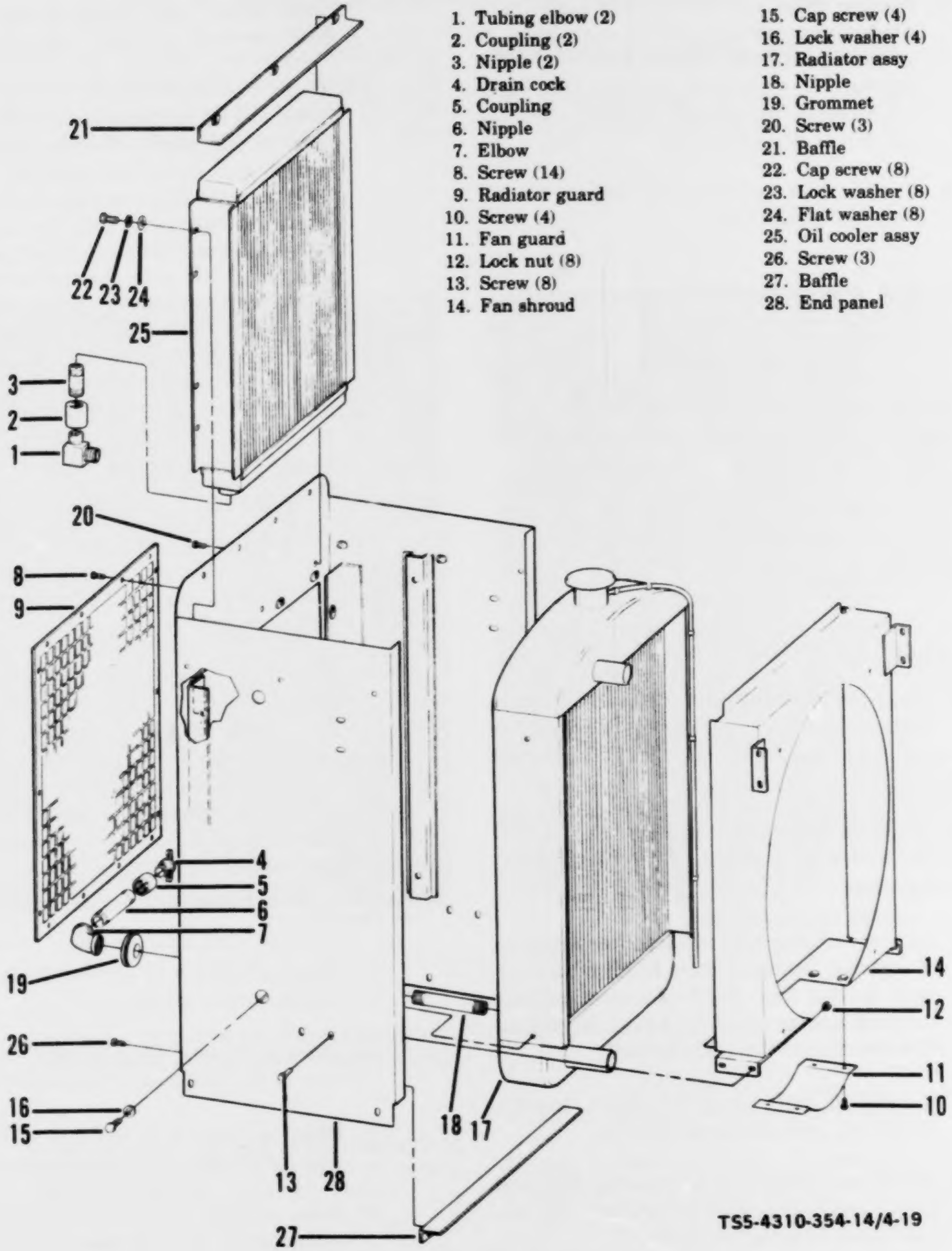
b. Disassembly. Refer to figure 4-19 and disassemble the radiator and oil cooler assembly in the sequence order of index numbers in the figure as follows:

(1) Remove the two tubing elbows (1), two couplings (2), and two nipples (3) from bottom of oil cooler assembly (25).

(2) Unscrew and remove drain cock (4), coupling (5), nipple (6), and elbow (7). Remove fourteen screws (8) and radiator guard (9).

(3) Remove four screws (10) and bottom fan guard (11). Remove eight lock nuts (12), eight screws (13), and fan shroud (14).

(4) Attach a suitable lifting device, such as a chain hoist, to the radiator assembly (17), remove the four cap screws (15), four lock washers (16), and remove the radiator assembly (17) away from end panel (28) pulling nipple (18) out of grommet (19). Remove nipple (18) from radiator assembly (17) and remove the grommet (19).


21
22
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18
17
27
14
12
11
10

1. Tubing elbow (2)
2. Coupling (2)
3. Nipple (2)
4. Drain cock
5. Coupling
6. Nipple
7. Elbow
8. Screw (14)
9. Radiator guard
10. Screw (4)
11. Fan guard
12. Lock nut (8)
13. Screw (8)
14. Fan shroud
15. Cap screw (4)
16. Lock washer (4)
17. Radiator assy
18. Nipple
19. Grommet
20. Screw (3)
21. Baffle
22. Cap screw (8)
23. Lock washer (8)
24. Flat washer (8)
25. Oil cooler assy
26. Screw (3)
27. Baffle
28. End panel

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Figure 4-19. Radiator and oil cooler assembly, disassembly and reassembly.

(5) Remove three screws (20) and baffle (21). Attach lifting device, such as chain hoist, to oil cooler assembly (25), remove eight cap screws (22), eight lock washers (23), eight flat washers (24), and lift oil cooler assembly (25) out of end panel (28).

(6) Remove three screws (26) and baffle (27) from end panel (28).

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

c. *Cleaning, Inspection, and Repair.*

(1) Clean the oil cooler and radiator cooling fins using compressed air blowing through the cooling area in direction opposite normal air flow.

(2) Clean all other parts with solvent, Federal Specification P-D-680, Type II, and dry thoroughly.

(3) Inspect radiator and oil cooler for evidence of leaking, damaged tank heads, and damaged cooling fins. Refer damaged radiator and oil cooler conditions to Direct or General Support maintenance.

(4) Inspect all other parts for cracks, breaks, distortion, and damaged threads.

(5) Repair is limited to straightening distorted parts, welding cracks or breaks, and replacement of defective parts.

d. *Reassembly.* Refer to figure 4-19 and reassemble the radiator and oil cooler assembly in the reverse sequence of index numbers in the figure as follows:

(1) Assemble baffle (27) to end panel (28) with three screws (26). Assemble with flat leg of baffle toward oil cooler assembly (25).

(2) Using a lifting device, such as a chain hoist, lower the oil cooler assembly (25) into position in end panel (28) and attach to end panel with eight flat washers (24), eight lock washers (23), and eight cap screws (22). Assemble baffle (21) with flat leg toward oil cooler assembly (25) and attach baffle (21) to end panel (28) with three screws (20).

(3) Using a lifting device, such as a chain hoist, position radiator assembly (17) in end panel (28) and attach with four lock washers (16) and four cap screws (15). Install grommet (19) in end panel hole and install nipple (18) through grommet into radiator assembly (17).

(4) Assemble fan shroud (14) to end panel (28) with eight screws (13) and eight lock nuts (12). Attach fan guard (11) to fan shroud (14) with four screws (10).

(5) Attach radiator guard (9) to end panel (28) with fourteen screws (8). Assemble elbow (7) onto nipple (18). Assemble nipple (6), coupling (5), and drain cock (4).

(6) Install two nipples (3) in bottom of oil cooler assembly (25), install two couplings (2) and two tubing elbows (1).

e. *Installation.*

(1) Refer to figure 4-18 and install the radiator and oil cooler group.

(2) Refer to figure 4-17 and install the roof section of the compressor enclosure group.

(3) Refer to figure 4-15 and install the engine and compressor air cleaner assemblies.

(4) Refer to figure 4-12 and install the exterior components on compressor enclosure.

(5) Connect the inlet and outlet oil hose assemblies to the elbows on the bottom of the oil cooler assembly. Close the two side doors.

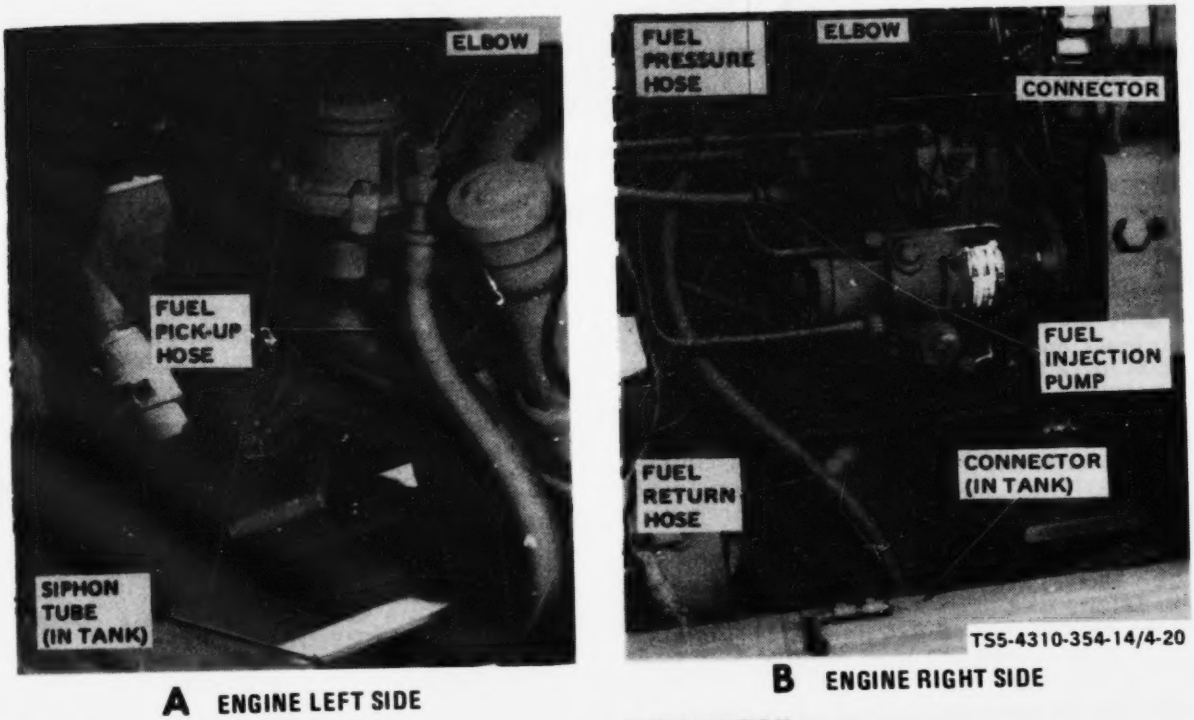
(6) Service the radiator as shown in figure 3-6.

Section XII. MAINTENANCE OF FUEL LINES, HOSES, AND FITTINGS

4-30. General. The fuel lines, hoses, and fittings referenced in this section are those which are not a part of the contained fuel system on the engine. The fuel system lines and fittings are covered in a later section.

4-31. Fuel Lines, Hoses, and Fittings.

a. Removal. Refer to figure 4-20 and remove the fuel lines, hoses, and fittings.



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A ENGINE LEFT SIDE

B ENGINE RIGHT SIDE

REMOVAL

STEP 1. REMOVE FUEL PICK-UP HOSE ASSEMBLY, ELBOW, AND FUEL TANK SIPHON TUBE.

STEP 2. REMOVE FUEL RETURN HOSE ASSEMBLY, CONNECTOR ON FUEL INJECTION PUMP, AND CONNECTOR ON FUEL TANK.

STEP 3. REMOVE FUEL PRESSURE HOSE ASSEMBLY, ELBOW ON FUEL INJECTION PUMP, AND CONNECTOR ON FUEL PRESSURE GAUGE (LOCATED ON INSTRUMENT PANEL ASSY).

INSTALLATION

STEP 1. INSTALL HOSE CONNECTOR ON FUEL PRESSURE GAUGE, INSTALL ELBOW ON FUEL INJECTION PUMP. INSTALL FUEL PRESSURE HOSE ASSEMBLY BETWEEN GAUGE AND INJECTION PUMP.

STEP 2. INSTALL HOSE CONNECTOR IN FUEL TANK AND IN FUEL INJECTION PUMP. INSTALL FUEL RETURN HOSE ASSEMBLY BETWEEN THESE TWO CONNECTORS.

STEP 3. INSTALL FUEL TANK SIPHON TUBE IN FUEL TANK. INSTALL ELBOW IN FUEL TRANSFER PUMP. INSTALL FUEL PICK-UP HOSE ASSEMBLY BETWEEN SIPHON TUBE AND ELBOW.

Figure 4-20. Fuel lines, hoses, and fittings, removal and installation.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-138°F (38°C-59°C).

b. Cleaning, Inspection, and Repair.

(1) Clean the fuel hoses by wiping with a clean cloth moistened with solvent, Federal Specification P-D-680, Type II and dry thoroughly.

(2) Inspect hose assemblies for cuts, breaks, frayed covering and damaged threads. Make certain there are no obstructions in the hoses. Inspect all fittings for damaged threads, cracks, and breaks.

(3) Repair is limited to the replacement of defective parts.

c. Installation. Refer to figure 4-20 and install the fuel lines, hoses, and fittings.

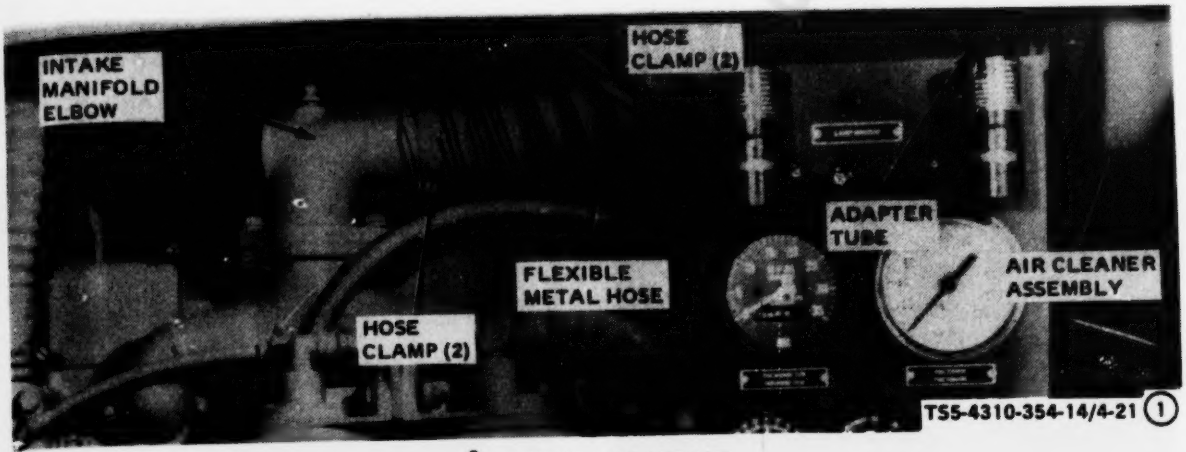
Section XIII. MAINTENANCE OF AIR LINES, HOSES, AND FITTINGS

4-32. General. The air lines, hoses, and fittings covered in this section consist of all air intake lines, both engine and compressor, and all compressor control air hoses, and fittings.

4-33. Air Lines, Hoses, and Fittings.

a. Removal.

(1) Remove the engine and compressor air intake lines, hoses, and fittings as shown in figure 4-21.


INTAKE MANIFOLD ELBOW
HOSE CLAMP (2)
ADAPTER TUBE
AIR CLEANER ASSEMBLY
FLEXIBLE METAL HOSE
HOSE CLAMP (2)
TS5-4310-354-14/4-21 ①

A ENGINE AIR INTAKE

REMOVAL

STEP 1. LOOSEN HOSE CLAMPS AND REMOVE FLEXIBLE METAL HOSE FROM ENGINE INTAKE MANIFOLD ELBOW AND ADAPTER TUBE.

STEP 2. LOOSEN HOSE CLAMP AND REMOVE ADAPTER TUBE. LOOSEN HOSE CLAMP AND DISCONNECT RESTRICTION INDICATOR HOSE FROM ADAPTER HOSE ASSEMBLY. REMOVE RESTRICTION INDICATOR HOSE FROM THE INDICATOR.

STEP 3. LOOSEN HOSE CLAMP AND REMOVE ADAPTER HOSE ASSEMBLY FROM ENGINE AIR CLEANER OUTLET.

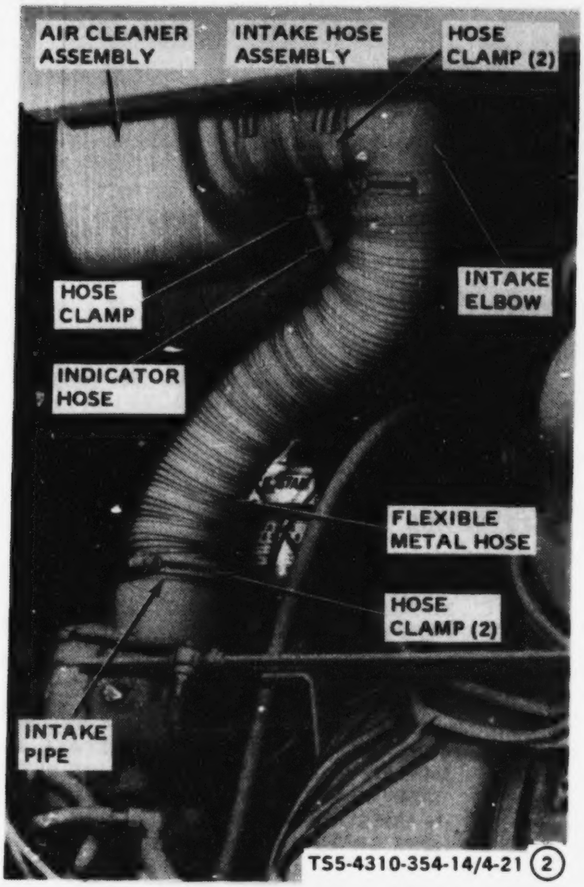
INSTALLATION

STEP 1. INSTALL ADAPTER HOSE ASSEMBLY ON ENGINE AIR CLEANER OUTLET. SECURE WITH HOSE CLAMP.

STEP 2. INSTALL RESTRICTION INDICATOR HOSE ON INDICATOR. INSTALL INDICATOR HOSE ON ADAPTER HOSE STEM AND SECURE WITH HOSE CLAMP. INSTALL ADAPTER HOSE STEM AND SECURE WITH HOSE CLAMP. INSTALL ADAPTER TUBE IN HOSE ASSEMBLY AND SECURE WITH HOSE CLAMP.

STEP 3. INSTALL FLEXIBLE METAL HOSE BETWEEN ADAPTER TUBE AND ENGINE INTAKE MANIFOLD ELBOW. SECURE EACH END WITH HOSE CLAMP.

Figure 4-21. Engine and compressor air intake lines, hoses, and fittings, removal and installation (sheet 1 of 2).



B COMPRESSOR AIR INTAKE

REMOVAL

STEP 1. LOOSEN HOSE CLAMPS AND REMOVE FLEXIBLE METAL HOSE FROM COMPRESSOR INTAKE PIPE AND INTAKE ELBOW.

STEP 2. LOOSEN HOSE CLAMP AND REMOVE INTAKE ELBOW. LOOSEN HOSE CLAMP AND DISCONNECT RESTRICTION INDICATOR HOSE FROM INTAKE HOSE ASSEMBLY. REMOVE RESTRICTION INDICATOR HOSE FROM THE INDICATOR.

STEP 3. LOOSEN HOSE CLAMP AND REMOVE THE INTAKE HOSE ASSEMBLY FROM COMPRESSOR AIR CLEANER OUTLET. ONLY WHEN NECESSARY, REMOVE INLET PIPE FROM COMPRESSOR.

INSTALLATION

STEP 1. AS NECESSARY, INSTALL COMPRESSOR INLET PIPE. INSTALL INTAKE HOSE ASSEMBLY ON COMPRESSOR AIR CLEANER OUTLET AND SECURE WITH HOSE CLAMP.

STEP 2. INSTALL RESTRICTION INDICATOR HOSE ON THE INDICATOR. CONNECT INDICATOR HOSE TO INTAKE HOSE ASSEMBLY STEM AND SECURE WITH HOSE CLAMP. INSTALL INTAKE ELBOW AND SECURE WITH HOSE CLAMP.

STEP 3. INSTALL FLEXIBLE METAL HOSE BETWEEN INTAKE ELBOW AND COMPRESSOR INTAKE PIPE. SECURE WITH HOSE CLAMPS ON EACH END.

Figure 4-21. Engine and compressor air intake lines, hoses, and fittings, removal and installation (sheet 2 of 2).

(2) Remove the compressor control air hoses and fittings as shown in figure 4-22.

WARNING

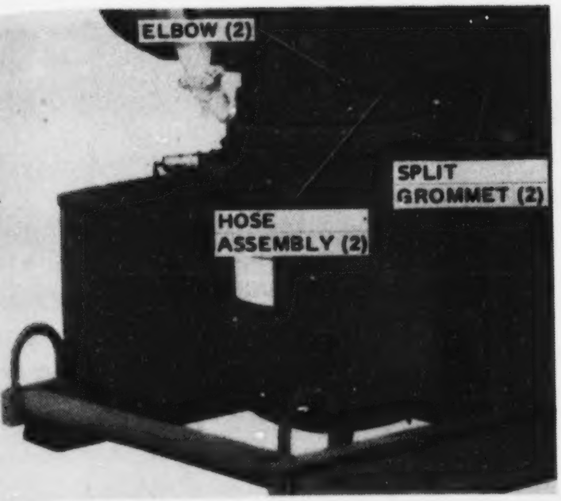
Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. Cleaning, Inspection, and Repair.

(1) Clean all hoses with a clean cloth soaked with solvent, Federal Specification P-D-680, Type II and dry thoroughly. Clean all fittings in this same solvent.

(2) Inspect fittings for cracks and damaged threads. Inspect hose assemblies for cuts, fraying, and any other damage to covering. Inspect hose ends for damaged threads and sealing seats. Check for any obstructions in hoses and fittings.

(3) Repair of the air lines, hoses, and fittings is restricted to replacement of all defective parts.


ELBOW (2)
SPLIT GROMMET (2)
HOSE ASSEMBLY (2)

A OIL SEPARATOR ASSEMBLY

REMOVAL

NOTE

TAG EACH HOSE ASSEMBLY AS IT IS REMOVED TO AID IN INSTALLATION.

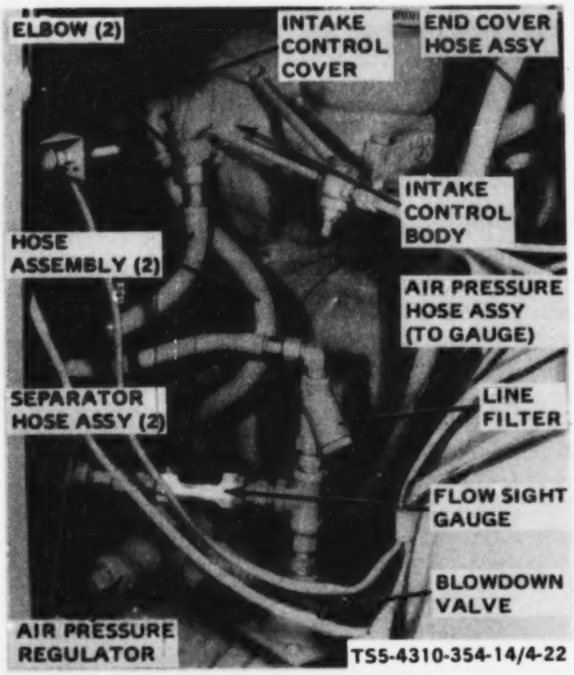
STEP 1. DISCONNECT THE TWO HOSE ASSEMBLIES FROM ELBOWS ON OIL SEPARATOR COVER. WORK THE SPLIT GROMMETS OUT OF END PANEL HOLES. DISCONNECT THE OTHER END OF THESE TWO HOSE ASSEMBLIES FROM BLOWDOWN ASSEMBLY.

STEP 2. DISCONNECT AND REMOVE HOSE ASSEMBLY FROM FLOW SIGHT GAUGE ELBOW AND ELBOW ON COMPRESSOR INTAKE CONTROL BODY. AS NECESSARY, REMOVE ELBOW FROM BODY.

STEP 3. DISCONNECT AND REMOVE HOSE ASSEMBLY FROM ELBOW ON AIR PRESSURE REGULATOR AND ELBOW ON COMPRESSOR INTAKE CONTROL COVER. AS NECESSARY, REMOVE ELBOW FROM COVER.

STEP 4. DISCONNECT AND REMOVE HOSE ASSEMBLY FROM BLOWDOWN ASSEMBLY AND AIR PRESSURE GAUGE ON INSTRUMENT PANEL ASSEMBLY.

STEP 5. AS NECESSARY, REMOVE HOSE ASSEMBLY FROM ELBOW ON COMPRESSOR INTAKE CONTROL BODY AND CONNECTOR ON STATOR DRIVE END COVER. AS NECESSARY, REMOVE ELBOW FROM INTAKE CONTROL BODY.


ELBOW (2)
INTAKE CONTROL COVER
END COVER HOSE ASSY
INTAKE CONTROL BODY
HOSE ASSEMBLY (2)
AIR PRESSURE HOSE ASSY (TO GAUGE)
SEPARATOR HOSE ASSY (2)
LINE FILTER
FLOW SIGHT GAUGE
BLOWDOWN VALVE
AIR PRESSURE REGULATOR

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B COMPRESSOR AIR CONTROL

INSTALLATION

STEP 1. IF REMOVED, INSTALL ELBOW IN INTAKE CONTROL BODY AND INSTALL HOSE ASSEMBLY ON ELBOW AND CONNECTOR ON STATOR DRIVE END COVER (SEE FIG. 5-1 FOR SCHEMATIC DIAGRAM).

STEP 2. INSTALL HOSE ASSEMBLY FROM AIR PRESSURE GAUGE ON INSTRUMENT PANEL TO BLOWDOWN ASSEMBLY.

STEP 3. IF REMOVED, INSTALL ELBOW IN INTAKE CONTROL COVER. INSTALL HOSE ASSEMBLY ON COVER ELBOW AND ELBOW ON PRESSURE REGULATOR.

STEP 4. IF REMOVED, INSTALL ELBOW IN INTAKE CONTROL BODY. INSTALL HOSE ASSEMBLY ON BODY ELBOW AND ELBOW ON FLOW SIGHT GAUGE.

STEP 5. INSTALL THE TWO HOSE ASSEMBLIES FROM BLOWDOWN ASSEMBLY TO OIL SEPARATOR COVER BY CONNECTING HOSES TO BLOWDOWN ASSEMBLY, INSTALL SPLIT GROMMETS ON HOSE, RUN HOSES THROUGH HOLES IN END PANEL, CONNECT HOSES TO ELBOWS ON OIL SEPARATOR COVER; THEN, WORK GROMMETS INTO END PANEL HOLES.

Figure 4-22. Compressor control air hoses and fittings, removal and installation.

c. Installation.

(1) Refer to figure 4-22 and install the compressor control air hoses and fittings.

(2) Refer to figure 4-21 and install the engine and compressor air intake lines, hoses, and fittings.

Section XIV. MAINTENANCE OF ENGINE FUEL FILTER GROUP

4-34. General. The engine fuel filter group consists of the spin-on type, throw-away fuel filter, fuel lines, and filter mounting base. The fuel filter is located on a dual mounting bracket with the engine lubricating oil filter on the left-hand side of the engine (facing engine flywheel).

4-35. Engine Fuel Filter Group.

a. Removal and Disassembly. Refer to figure 4-23 to remove and disassemble the fuel filter group.

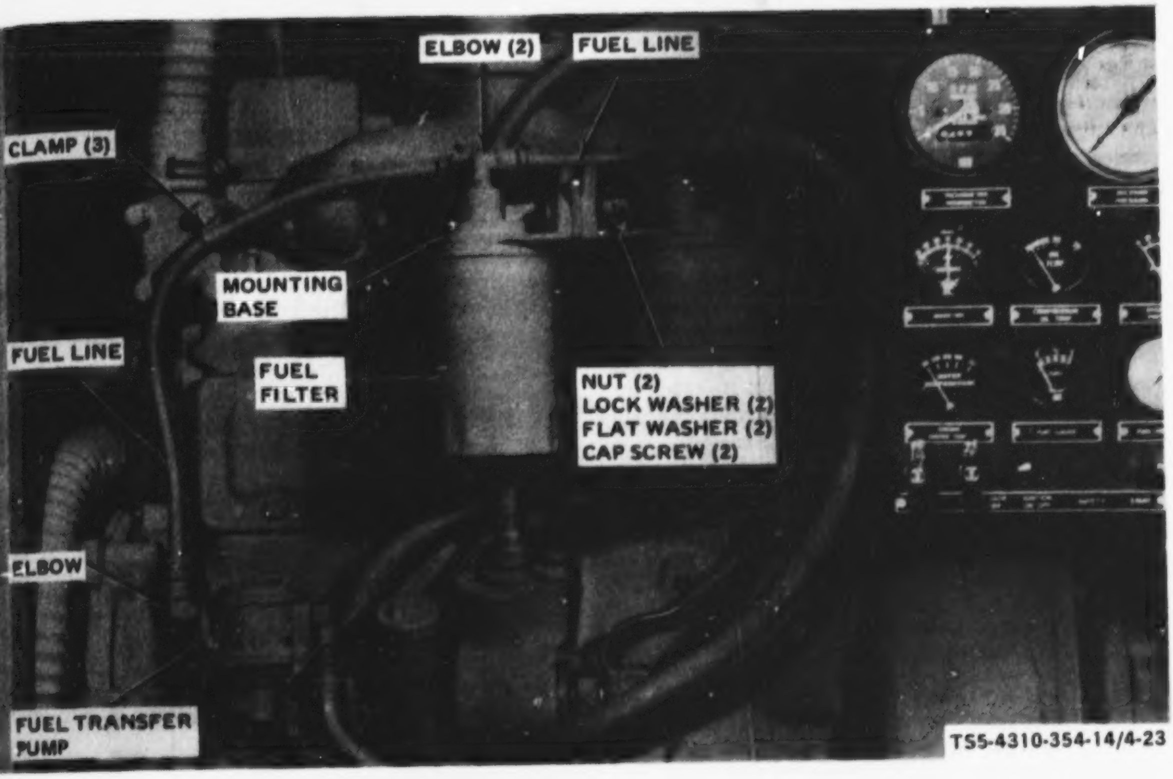
b. Cleaning, Inspection, and Repair.

(1) Clean the underside of the mounting base with a clean, lint-free cloth soaked with clean diesel fuel.

(2) Inspect the mounting base stud for damaged threads, and cracks or breaks. Inspect the mounting base for cracks and breaks. Inspect the fuel lines for evidence of leakage, breaks in covering, and connector threads.

(3) Repair of the engine fuel filter group is limited to the replacement of defective parts.

c. Reassembly and Installation. Refer to figure 4-23 to reassemble and install the engine fuel filter group.



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REMOVAL AND DISASSEMBLY

STEP 1. DISCONNECT FUEL LINE FROM FUEL TRANSFER PUMP AND INLET ELBOW ON TOP OF MOUNTING BASE. AS NECESSARY, REMOVE ELBOWS FROM TRANSFER PUMP AND MOUNTING BASE.

STEP 2. DISCONNECT FUEL LINE FROM MOUNTING BASE OUTLET ELBOW AND FROM FUEL INJECTION PUMP INLET. AS NECESSARY, REMOVE ELBOW FROM MOUNTING BASE.

STEP 3. REMOVE THE FUEL LINE CLAMPS AND FUEL LINES FROM UNIT.

STEP 4. USE A STRAP-TYPE WRENCH AND UNSCREW THE SPIN-ON TYPE FILTER ELEMENT. DISCARD ELEMENT.

STEP 5. AS NECESSARY, REMOVE THE NUTS, LOCK WASHERS, FLAT WASHER, CAP SCREWS, AND FUEL FILTER MOUNTING BASE FROM ENGINE BRACKET.

STEP 6. THE MOUNTING BASE STUD NEED BE REMOVED FROM BASE ONLY WHEN REPLACEMENT IS NECESSARY.

REASSEMBLY AND INSTALLATION

STEP 1. IF REMOVED, ASSEMBLE MOUNTING BASE STUD INTO BASE. TIGHTEN SECURELY.

STEP 2. AS NECESSARY, ASSEMBLE FUEL FILTER MOUNTING BASE TO ENGINE BRACKET WITH CAP SCREWS, FLAT WASHERS, LOCK WASHERS, AND NUTS.

STEP 3. INSTALL A NEW SPIN-ON TYPE FUEL FILTER ELEMENT AND TIGHTEN WITH A STRAP-TYPE WRENCH.

STEP 4. AS NECESSARY, INSTALL INLET AND OUTLET ELBOWS IN MOUNTING BASE. CONNECT FUEL LINE TO OUTLET ELBOW AND FUEL INJECTION PUMP INLET.

STEP 5. AS NECESSARY, INSTALL ELBOW IN FUEL TRANSFER PUMP OUTLET. CONNECT FUEL LINE TO TRANSFER PUMP OUTLET ELBOW AND FILTER INLET ELBOW.

STEP 6. SECURE THE FUEL LINES WITH HOSE CLAMPS.

Figure 4-23. Engine fuel filter group, removal, disassembly, reassembly, and installation.

Section XV. MAINTENANCE OF ENGINE ELECTRICAL GROUP

4-36. General. The engine electrical group consists of the 12-volt battery, the battery charging receptacle, engine starting motor, alternator, and necessary cables and wiring. The engine starting motor engages the ring gear on the flywheel and cranks the engine for starting. The starting motor receives its power source from the 12-volt battery. The alternator restores electrical energy to the battery and supplies electrical power to meet the electrical demand of the engine and accessories when the unit is operating. The alternator has an integral regulating device that regulates the alternator output within its rated limits. The battery charging receptacle permits charging of the battery from an outside power source.

4-37. Starting Motor Assembly.

WARNING

Disconnect battery cable clamps from battery terminals before removing starting motor assembly.

a. Removal. Remove the starting motor assembl as shown in figure 4-24.

REMOVAL

STEP 1. REMOVE SOLENOID TERMINAL NUTS AND LOCK WASHERS. REMOVE BATTERY CABLE AND WIRING HARNESS LEADS FROM TERMINALS.

STEP 2. REMOVE NUTS AND LOCK WASHER AND REMOVE STARTING MOTOR ASSEMBLY FROM FLYWHEEL HOUSING STUDS.

INSTALLATION

STEP 1. INSTALL STARTING MOTOR ASSEMBLY ON FLYWHEEL HOUSING STUDS. SECURE WITH LOCK WASHERS AND NUTS.

STEP 2. INSTALL WIRING HARNESS LEADS AND BATTERY CABLE ON SOLENOID TERMINALS. SECURE WITH LOCK WASHERS AND NUTS. REFER TO FIG 1-3 FOR WIRING DIAGRAM.

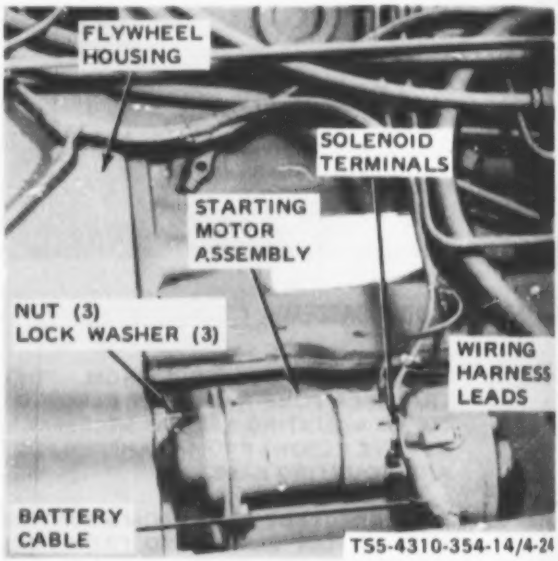


Figure 4-24. Starting motor assembly, removal and installation.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. *Cleaning and Inspection.*

(1) Clean exterior surfaces of the starting motor assembly with a clean cloth soaked with solvent, Federal Specification P-D-680, Type II. Dry thoroughly. Blow any dust and dirt out of the inside of the assembly with dry compressed air.

(2) Inspect the drive assembly gear teeth for chipping, cracks, and broken teeth, or any other defects.

(3) Inspect brushes and springs for excessive wear, cracks, distortion, or any other defect.

(4) Inspect attaching hardware for distortion, cracks, breaks, damaged threads, or any other defect.

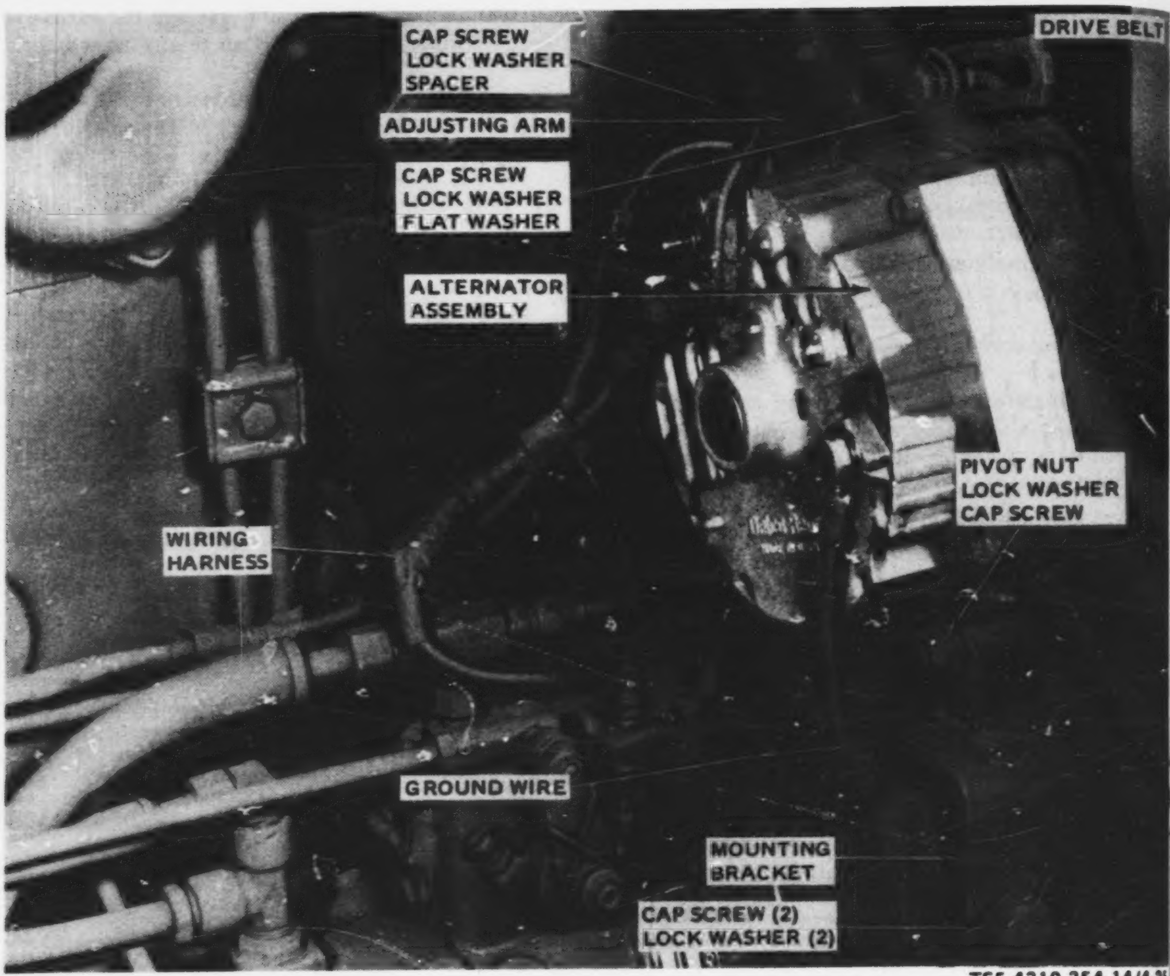
c. *Installation.* Install the starting motor assembly as shown in figure 4-24; then, connect battery cable clamps on battery terminals.

4-38. Alternator Assembly.

WARNING

Disconnect battery cable clamps from battery terminals before removing alternator assembly.

a. *Removal.* Remove the alternator assembly as shown in figure 4-25.


CAP SCREW
LOCK WASHER
SPACER
ADJUSTING ARM
CAP SCREW
LOCK WASHER
FLAT WASHER
ALTERNATOR ASSEMBLY
DRIVE BELT
PIVOT NUT
LOCK WASHER
CAP SCREW
WIRING HARNESS
GROUND WIRE
MOUNTING BRACKET
CAP SCREW (2)
LOCK WASHER (2)

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REMOVAL

STEP 1. DISCONNECT THE ALTERNATOR GROUND WIRE AND WIRING HARNESS LEADS.

STEP 2. LOOSEN PIVOT NUT, ADJUSTING ARM CAP SCREWS, AND MOVE ALTERNATOR ASSEMBLY TOWARD ENGINE TO LOOSEN DRIVE BELT. REMOVE DRIVE BELT FROM ALTERNATOR PULLEY.

STEP 3. REMOVE ADJUSTING ARM CAP SCREW, LOCK WASHER, AND SPACER. REMOVE CAP SCREW, LOCK WASHER, FLAT WASHER, AND ADJUSTING ARM.

STEP 4. REMOVE NUT, LOCK WASHER, AND CAP SCREW FROM ALTERNATOR MOUNTING AND PIVOT BRACKET. REMOVE THE ALTERNATOR ASSEMBLY.

INSTALLATION

STEP 1. INSTALL THE ALTERNATOR ASSEMBLY IN POSITION ON PIVOT AND MOUNTING BRACKET. INSTALL CAP SCREW, LOCK WASHER, AND NUT. DO NOT TIGHTEN PIVOT NUT UNTIL AFTER BELT IS ADJUSTED.

STEP 2. INSTALL ADJUSTING ARM, FLAT WASHER, LOCK WASHER, AND CAP SCREW. DO NOT TIGHTEN. INSTALL SPACER BETWEEN ADJUSTING ARM AND WATER PUMP AND INSTALL LOCK WASHER AND CAP SCREW. DO NOT TIGHTEN.

STEP 3. INSTALL DRIVE BELT ON ALTERNATOR PULLEY; THEN, ADJUST DRIVE BELT (FIG 4-5). TIGHTEN PIVOT NUT AND ADJUSTING ARM CAP SCREWS.

Figure 4-25. Alternator assembly, removal and installation.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. Cleaning and Inspection.

(1) Clean the exterior surfaces of the alternator assembly with a clean cloth soaked with solvent, Federal Specification P-D-680, Type II. Dry thoroughly. Blow dust and dirt from the inside of the assembly with dry compressed air.

(2) Inspect brush and holder assembly for excessive wear, cracks, or any other defect.

(3) Inspect the drive belt and pulley for wear, cracks, or any other defect.

(4) Inspect attaching hardware for distortion, cracks, damaged threads, or any other defect.

c. Installation. Install the alternator assembly as shown in figure 4-25. Adjust drive belt tension (figure 4-5) and connect the battery cable clamps to battery terminals.

4-39. Battery. Refer to figure 4-10 for battery and cable removal and installation.

4-40. Battery Charging Receptacle. Refer to figure 4-10 for battery charging receptacle removal and installation. Refer to paragraph 4-22.*b*.(2) for cleaning and inspection.

Section XVI. MAINTENANCE OF ENGINE FUEL SYSTEM, COOLING SYSTEM, INTAKE, AND EXHAUST MANIFOLD GROUP

4-41. General. This section consists of the organizational level maintenance of the engine fuel injection nozzles, fuel transfer pump, related fuel injection lines, cooling fan, water pump assembly, thermostat, temperature sending units and switches, the engine intake and exhaust manifolds.

4-42. Engine Fuel Injection Nozzles.

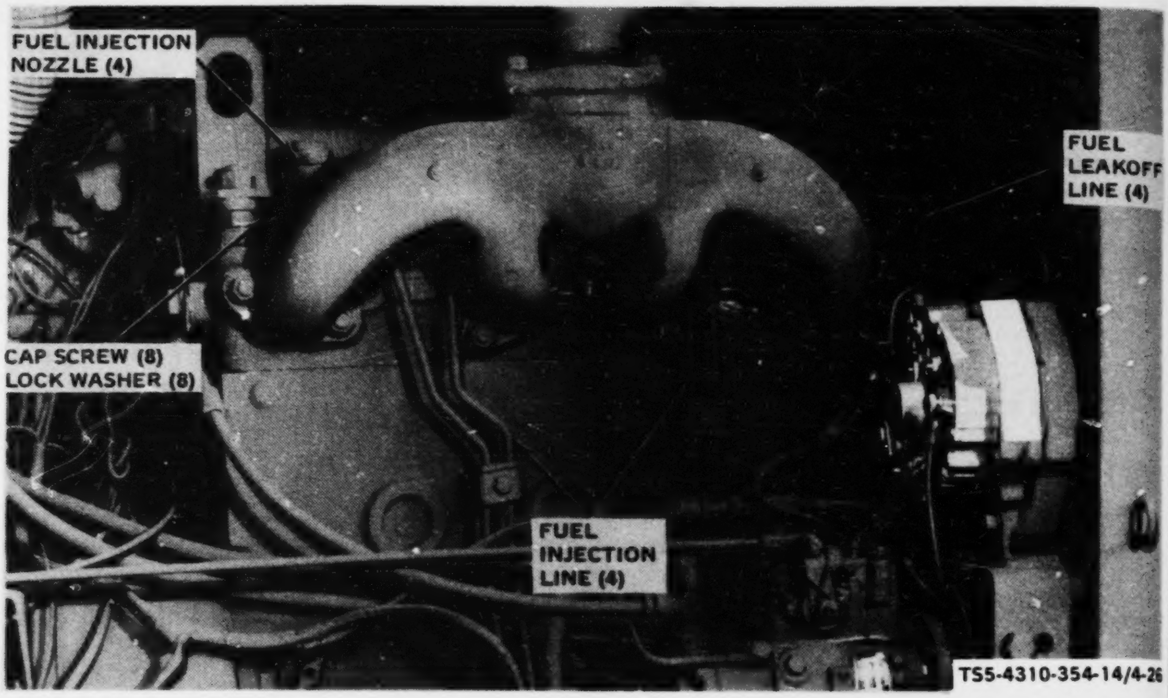
CAUTION

Handle the fuel injection nozzles with care at all times to prevent damage.

NOTE

As each injection nozzle and fuel line is removed, mark or tag for installation reference. Injection nozzles and fuel lines should be installed in the same location as removed.

a. Removal. Remove the fuel injection nozzles as shown in figure 4-26.


FUEL INJECTION NOZZLE (4)
FUEL LEAKOFF LINE (4)
CAP SCREW (8) LOCK WASHER (8)
FUEL INJECTION LINE (4)
TS5-4310-354-14/4-26

REMOVAL

STEP 1. LOOSEN FUEL INJECTION LINE NUT AND DISCONNECT THE FUEL LINE FROM INJECTION NOZZLE. DO NOT REMOVE NUT AND FERRULE FROM FUEL LINE.

STEP 2. DISCONNECT AND TAG FUEL LEAKOFF LINES FROM EACH INJECTION NOZZLE.

STEP 3. REMOVE CAP SCREWS AND LOCK WASHERS AND REMOVE FUEL INJECTION NOZZLE FROM CYLINDER HEAD. TAG THE NOZZLE FOR INSTALLATION REFERENCE.

INSTALLATION

STEP 1. INSTALL FUEL INJECTION NOZZLE IN SAME POSITION AS REMOVED FROM CYLINDER HEAD. REMOVE TAG AND SECURE NOZZLE TO CYLINDER HEAD WITH LOCK WASHERS AND CAP SCREWS.

CAUTION

TIGHTEN CAP SCREWS EVENLY TO ENSURE PROPER ALIGNMENT. USE A TORQUE WRENCH AND PROGRESSIVELY TIGHTEN CAP SCREWS TO 25-30 FOOT-POUNDS TO OBTAIN EQUAL TENSION ON BOTH SIDES OF FLANGE.

STEP 2. INSTALL LEAKOFF LINES TO EACH INJECTION NOZZLE AND REMOVE TAG.

STEP 3. INSTALL FUEL LINE ON INJECTION NOZZLE AND TIGHTEN NUT.

Figure 4-26. Fuel injection nozzles, removal and installation.

b. Cleaning and Inspection.

(1) Clean the fuel injection nozzles with clean diesel fuel. Dry thoroughly with filtered, dry compressed air. Blow air through the leakoff lines to ensure that they are clear and unobstructed.

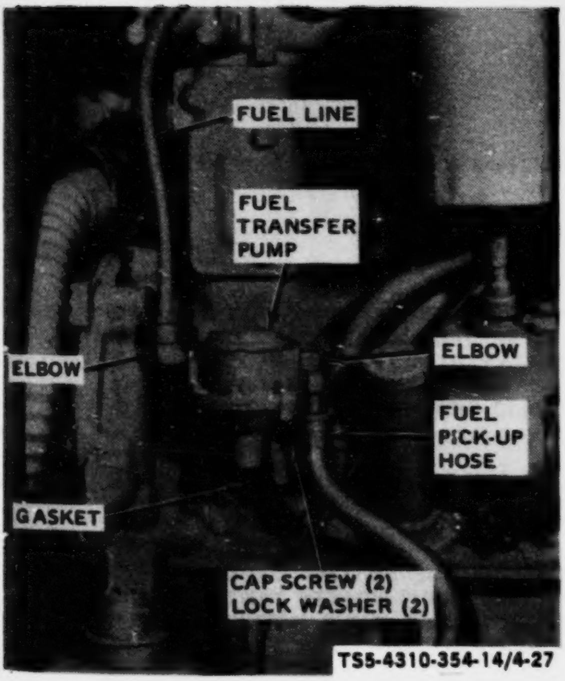
(2) Inspect the fuel lines for cracks, dents, kinks, loose or damaged ferrules, and damaged threads. Damaged lines are to be replaced.

(3) Inspect the fuel injection nozzles for cracks, breaks, or any other damage. Inspect hardware for distortion and damaged threads.

c. Installation. Install the fuel injection nozzles as shown in figure 4-26.

4-43. Fuel Transfer Pump.

a. Removal. Remove the fuel transfer pump as shown in figure 4-27.



REMOVAL

STEP 1. DISCONNECT FUEL PICK-UP HOSE ASSEMBLY. DISCONNECT TRANSFER PUMP OUTLET FUEL LINE. BE CAREFUL NOT TO LOOSE EYELET FROM OUTLET FUEL LINE.

STEP 2. REMOVE CAP SCREWS AND LOCK WASHERS THAT SECURE TRANSFER PUMP TO CYLINDER BLOCK.

STEP 3. REMOVE THE TRANSFER PUMP AND GASKET. DISCARD GASKET.

INSTALLATION

STEP 1. INSTALL A NEW GASKET AND THE FUEL TRANSFER PUMP IN POSITION ON CYLINDER BLOCK.

STEP 2. SECURE TRANSFER PUMP WITH LOCK WASHERS AND CAP SCREWS.

STEP 3. CONNECT THE PUMP OUTLET FUEL LINE AND FUEL PICK-UP HOSE ASSEMBLY. REFER TO FIG 3-17 AND PURGE AIR FROM SYSTEM.

Figure 4-27. Fuel transfer pump, removal and installation.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-138°F (38°C-59°C).

b. Cleaning and Inspection.

(1) Wipe the exterior of the fuel transfer pump with a clean cloth dampened with solvent, Federal Specification P-D-680, Type II. Dry thoroughly.

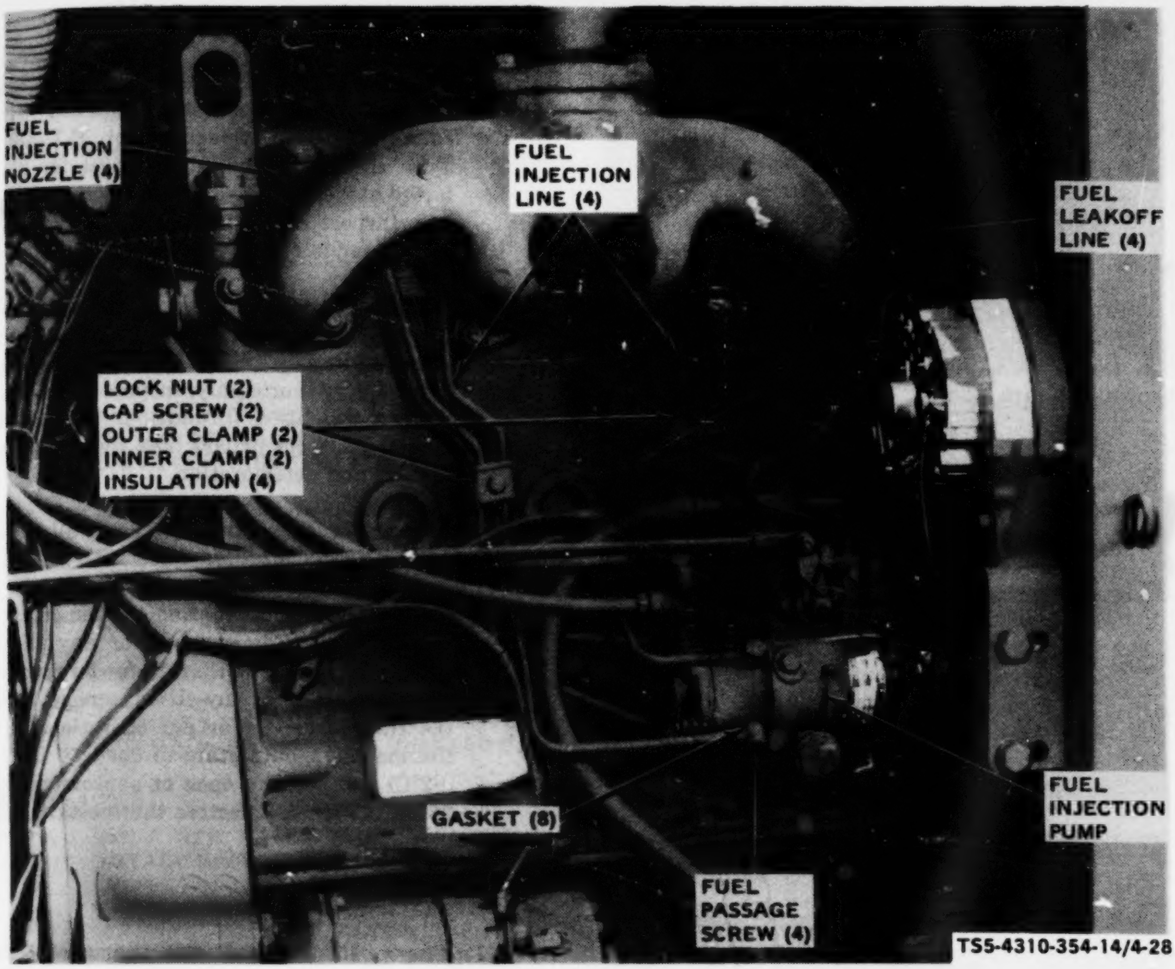
(2) Inspect the fuel pump rocker arm for fre movement. Check that priming lever operates freely without binding. Inspect for any crack, breaks, damaged threads, or any other damage.

(3) Inspect fuel line for crack, kinks, missing eyelet, damaged threads, or any other damage. Inspect fuel line fittings to ensure they are clear of any obstructions and that threads are not damaged.

c. *Installation.* Install the fuel transfer pump a shown in figure 4-27.

4-44. Fuel Injection Lines.

a. *Removal.* Remove the fuel injection lines a shown in figure 4-28.


FUEL INJECTION NOZZLE (4)
FUEL INJECTION LINE (4)
FUEL LEAKOFF LINE (4)
LOCK NUT (2)
CAP SCREW (2)
OUTER CLAMP (2)
INNER CLAMP (2)
INSULATION (4)
FUEL INJECTION PUMP
GASKET (8)
FUEL PASSAGE SCREW (4)

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REMOVAL

STEP 1. TAG EACH FUEL LINE FOR INSTALLATION REFERENCE. EACH LINE MUST BE INSTALLED IN THE SAME LOCATION AS REMOVED. REMOVE LOCKNUT, CAP SCREW, OUTER AND INNER CLAMP, AND CLAMP INSULATION.

STEP 2. LOOSEN FUEL INJECTION LINE NUT AND DISCONNECT LINE FROM EACH FUEL INJECTION NOZZLE.

STEP 3. REMOVE FUEL PASSAGE SCREWS AND GASKETS THAT ATTACH FUEL LINES TO FUEL INJECTION PUMP. DISCARD GASKETS. REMOVE FUEL INJECTION LINES.

INSTALLATION

STEP 1. USE NEW FUEL PASSAGE SCREW GASKETS, TWO EACH FUEL LINE. INSTALL FUEL LINES TO FUEL INJECTION PUMP AND ATTACH WITH GASKETS AND FUEL PASSAGE SCREWS.

STEP 2. CONNECT EACH FUEL LINE TO ITS RESPECTIVE FUEL INJECTION NOZZLE AND TIGHTEN FUEL LINE NUT.

STEP 3. INSTALL CLAMP INSULATION, INNER AND OUTER CLAMP TO FUEL LINES 1 AND 2 AND SECURE WITH CAP SCREW AND LOCK NUT. IN LIKE MANNER, INSTALL CLAMP ON FUEL LINES 3 AND 4. REMOVE TAGS FROM FUEL LINES.

Figure 4-28. Fuel injection lines, removal and installation.

b. Cleaning and Inspection.

(1) Wipe the fuel lines with a cloth dampened with clean diesel fuel. Blow air through each line to ensure that they are clear and unobstructed.

(2) Inspect the fuel lines for cracks, dents, kinks, loose or damaged ferrules, and damaged threads. Damaged fuel lines shall be replaced.

c. Installation. Install the fuel injection lines as shown in figure 4-28.

4-45. Cooling Fan, Water Pump, and Thermostat.

a. Removal. Refer to paragraph 4-29.*a.* and remove the radiator and oil cooler group to gain access to these components; then, proceed with removal as follows:

(*1*) *Cooling fan.* Remove the cooling fan as shown in figure 4-29.

(*2*) *Water pump.* Loosen and remove drive belt; then, remove the water pump as shown in figure 4-29.

(*3*) *Thermostat.* Remove the thermostat as shown in figure 4-29.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. Cleaning and Inspection.

(*1*) *Cooling fan.* Clean the cooling fan and spacer with a clean cloth dampened with solvent, Federal Specification P-D-680, Type II. Dry thoroughly. Inspect for distorted blades, cracks, breaks, or other damage. Inspect attaching hardware for damaged threads.

(*2*) *Water pump.* Clean the water pump assembly with a clean cloth dampened with solvent, Federal Specification P-D-680, Type II. Dry thoroughly. Inspect for cracks, breaks, damaged threads, or any other damage. Inspect bypass hose for any cuts, breaks, and deterioration.

(*3*) *Thermostat.* Clean the exterior of all parts with a clean cloth dampened with solvent, Federal Specification P-D-680, Type II. Dry thoroughly. Inspect thermostat housing for cracks, breaks, loose plug, or any other damage. Inspect the thermostat for cracks, excessive scale, or any other damage. Test the thermostat for proper operation. The thermostat should start to open at 180°F (82°C) and be fully open at approximately 200°F (93°C). A defective thermostat shall be replaced.

c. Installation.

(*1*) *Thermostat.* Install the thermostat as shown in figure 4-29.

(*2*) *Water pump.* Install the water pump assembly as shown in figure 4-29.

(*3*) *Cooling fan.* Install the cooling fan as shown in figure 4-29.

(*4*) *Radiator and oil cooler group.* Install the radiator and oil cooler group as instructed in paragraph 4-29.*e*.

COOLING FAN

MOVAL

EP 1. REMOVE CAP SCREWS, LOCK WASHERS, AND COOLING FAN.

EP 2. REMOVE THE FAN SPACER FROM PULLEY HUB.

STALLATION

EP 1. INSTALL FAN SPACER ON PULLEY HUB.

EP 2. INSTALL COOLING FAN AND SECURE WITH LOCK WASHERS AND CAP SCREWS.

WATER PUMP

MOVAL

EP 1. REMOVE THE COOLING FAN AS SHOWN IN "A" OF THIS FIGURE. REMOVE THE DRIVE BELT. (REF FIG 4-5.)

EP 2. LOOSEN HOSE CLAMPS AND REMOVE BYPASS HOSE AND LOWER RADIATOR HOSE. REMOVE CAP SCREW, LOCK WASHER, AND SPACER SECURING ALTERNATOR ADJUSTING ARM TO WATER PUMP. MOVE ADJUSTING ARM AWAY FROM WATER PUMP.

EP 3. REMOVE CAP SCREWS AND LOCK WASHER SECURING WATER PUMP ASSEMBLY TO CYLINDER BLOCK. REMOVE WATER PUMP ASSEMBLY AND GASKET. DISCARD GASKET.

STALLATION

EP 1. USE A NEW WATER PUMP GASKET AND INSTALL GASKET AND WATER PUMP ON CYLINDER BLOCK. SECURE WITH LOCK WASHERS AND CAP SCREWS. TIGHTEN CAP SCREWS EVENLY AND ALTERNATELY.

EP 2. MOVE ALTERNATOR ADJUSTING ARM INTO POSITION. INSTALL SPACER, LOCK WASHER, AND CAP SCREW ATTACHING ADJUSTING ARM TO WATER PUMP. DO NOT TIGHTEN UNTIL DRIVE BELT IS ADJUSTED.

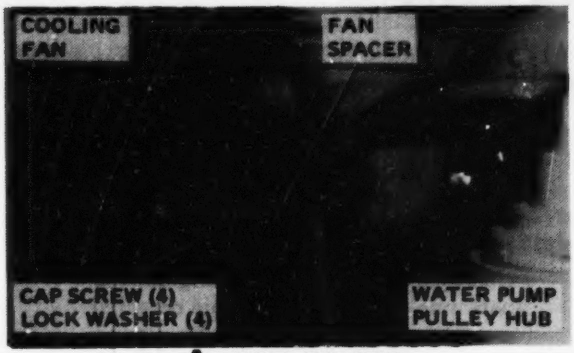
EP 3. INSTALL BYPASS HOSE AND TIGHTEN HOSE CLAMPS. INSTALL DRIVE BELT AND ADJUST (REF FIG 4-5). INSTALL COOLING FAN AS SHOWN IN "A" OF THIS FIGURE.

THERMOSTAT

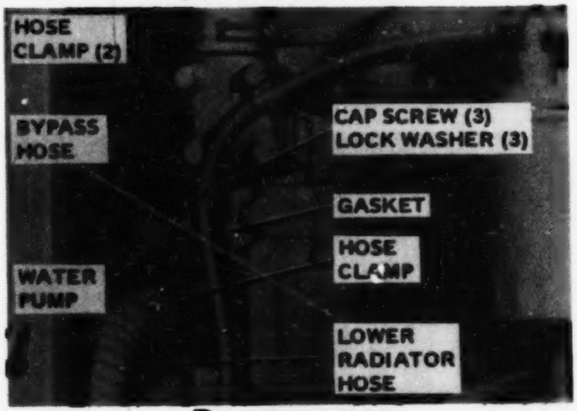
EMOVAL

EP 1. LOOSEN HOSE CLAMP AND DISCONNECT UPPER RADIATOR HOSE. REMOVE CAP SCREWS AND LOCK WASHERS AND REMOVE THERMOSTAT HOUSING FROM CYLINDER HEAD.

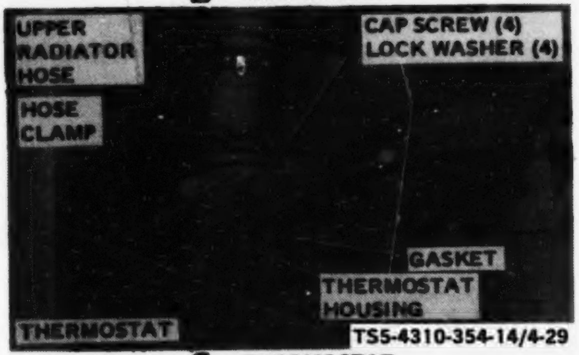
EP 2. REMOVE AND DISCARD GASKET. REMOVE THE THERMOSTAT.


COOLING FAN
FAN SPACER
CAP SCREW (4)
LOCK WASHER (4)
WATER PUMP PULLEY HUB

A COOLING FAN


HOSE CLAMP (2)
BYPASS HOSE
CAP SCREW (3)
LOCK WASHER (3)
GASKET
HOSE CLAMP
WATER PUMP
LOWER RADIATOR HOSE

B WATER PUMP


UPPER RADIATOR HOSE
CAP SCREW (4)
LOCK WASHER (4)
HOSE CLAMP
GASKET
THERMOSTAT HOUSING
THERMOSTAT
TS5-4310-354-14/4-29

C THERMOSTAT

INSTALLATION

STEP 1. INSTALL THERMOSTAT IN CYLINDER HEAD. USE A NEW GASKET AND INSTALL GASKET AND THERMOSTAT HOUSING.

STEP 2. SECURE THE THERMOSTAT HOUSING TO CYLINDER HEAD WITH LOCK WASHERS AND CAP SCREWS ATTACHING FUEL FILTER INLET LINE CLAMP UNDER HEAD OF UPPER RIGHT CAP SCREW. CONNECT UPPER RADIATOR HOSE AND TIGHTEN CLAMP.

Figure 4-29. Cooling fan, water pump, and thermostat, removal and installation.

4-46. Intake Manifold.

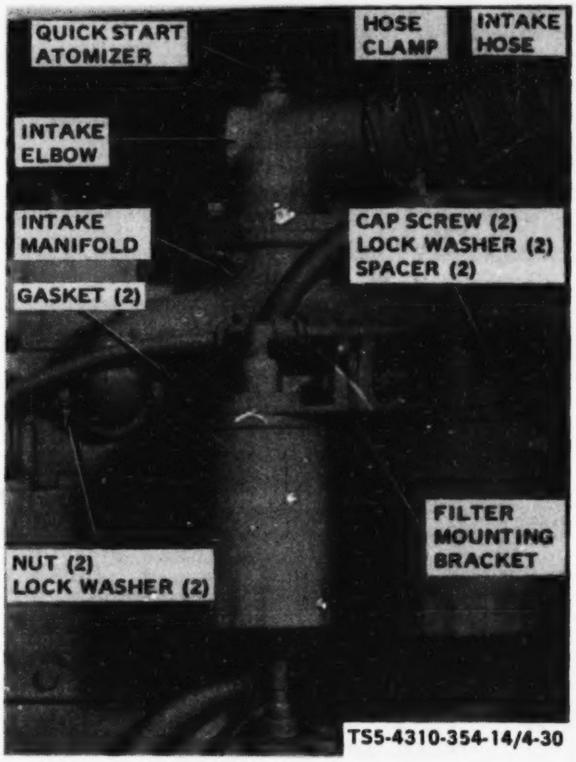
a. Removal. Remove the engine intake manifold as shown in figure 4-30.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. Cleaning and Inspection. Clean the intake manifold with solvent, Federal Specification P-D-680, Type II. Dry thoroughly. Make certain gasket surfaces on manifold and cylinder head are clean. Inspect the manifold for cracks, distortion, breaks, and mounting hardware for damaged threads.

c. Installation. Install the intake manifold as shown in figure 4-30.



REMOVAL

STEP 1. LOOSEN HOSE CLAMP AND DISCONNECT ENGINE INTAKE FLEXIBLE METAL HOSE. REMOVE QUICK START ATOMIZER FROM INTAKE ELBOW.

STEP 2. REMOVE CAP SCREWS, LOCK WASHERS, AND SPACERS THAT ATTACH FILTER MOUNTING BRACKET AND INTAKE MANIFOLD TO CYLINDER HEAD. CAREFULLY LAY FUEL AND OIL FILTER ASSEMBLY OUT OF THE WAY OF MANIFOLD REMOVAL.

STEP 3. REMOVE NUTS, LOCK WASHERS, INTAKE MANIFOLD, AND GASKETS FROM ENGINE. DISCARD GASKETS.

INSTALLATION

STEP 1. USE NEW INTAKE MANIFOLD GASKETS; INSTALL GASKETS AND INTAKE MANIFOLD ON ENGINE. SECURE WITH LOCK WASHERS AND NUTS.

NOTE

WHEN INSTALLING MANIFOLD MOUNTING HARDWARE, TIGHTEN NUTS AND CAP SCREWS LIGHTLY AT FIRST; THEN, STARTING AT CENTER OF MANIFOLD, WORK OUTWARD TIGHTENING PROGRESSIVELY IN STEPS TO 30 TO 40 FOOT-POUNDS TORQUE.

STEP 2. POSITION FUEL AND OIL FILTER ASSEMBLY AND INSTALL SPACERS, FILTER MOUNTING BRACKET, LOCK WASHERS, AND CAP SCREWS.

STEP 3. INSTALL QUICK START ATOMIZER IN INTAKE ELBOW. INSTALL ENGINE INTAKE FLEXIBLE METAL HOSE AND TIGHTEN HOSE CLAMP.

Figure 4-30. Intake manifold, removal and installation.

. Exhaust Manifold.

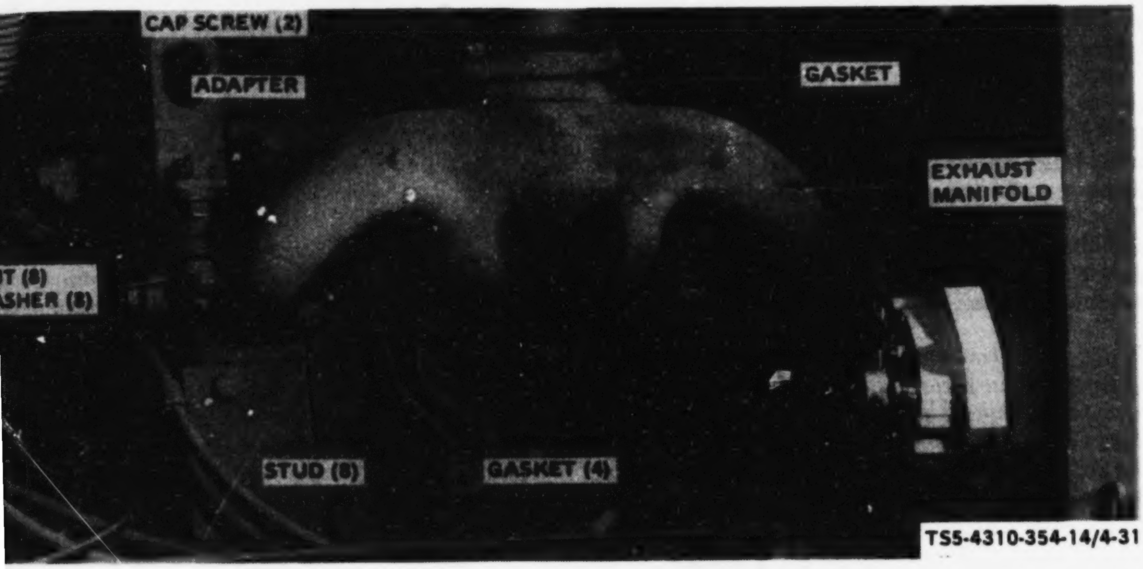
Removal. Remove exhaust muffler with rain the exhaust piping, and remove the exhaust ifold as shown in figure 4-31.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-138°F (38°C-59°C).

b. Cleaning and Inspection. Clean the exhaust manifold by brushing with a wire brush; then, clean with solvent, Federal Specification P-D-680, Type II. Dry thoroughly. Inspect for cracks, breaks, distortion, and severe rusting. Inspect mounting hardware for damaged threads.

c. Installation. Install exhaust manifold as shown in figure 4-31; then, install exhaust piping and muffler with rain cap.



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IOVAL

P 1. REMOVE NUTS AND WASHERS FROM CYLINDER HEAD STUDS.

P 2. REMOVE EXHAUST MANIFOLD FROM STUDS. REMOVE AND DISCARD GASKETS.

P 3. AS NECESSARY, REMOVE CAP SCREWS, ADAPTER, AND ADAPTER GASKET. DISCARD THE GASKET.

ALLATION

1. AS NECESSARY, INSTALL A NEW ADAPTER GASKET, ADAPTER, AND CAP SCREWS.

NOTE

WHEN TIGHTENING MANIFOLD NUTS, START TIGHTENING SEQUENCE AT THE CENTER OF MANIFOLD AND WORK OUTWARD. TIGHTEN IN PROGRESSIVE STEPS TO 30 TO 40 FOOT-POUNDS TORQUE.

STEP 2. INSTALL NEW MANIFOLD GASKETS AND MANIFOLD ON CYLINDER HEAD STUDS. SECURE WITH WASHERS AND NUTS.

Figure 4-31. Exhaust manifold, removal and installation.

4-48. Water Temperature Sending Unit and Shutdown Switch.

a. Removal. Remove radiator cap, open radiator drain cock, drain coolant from radiator to a level below the engine cylinder head; then, close drain cock. Unscrew and remove the water temperature sending unit from the engine cylinder head on the flywheel end of the engine. Disconnect the two wire assemblies from water temperature shutdown switch and remove the switch from engine cylinder head next to instrument panel.

b. Cleaning and Inspection. Wipe the water temperature sending unit sensing bulb with a clean, lint-free cloth and inspect for damage to bulb and threads. Wipe the water temperature shutdown switch sensing bulb with a clean, lint-free cloth. Inspect for damage to sensing bulb, threads, and wire terminals.

c. Repair. Repair of the water temperature sensing unit is limited to the replacement of the water temperature gauge with sensing bulb. Also, replace a defective water temperature shutdown switch.

d. Testing. Test the water temperature gauge and sensing bulb and the water temperature shutdown switch as follows:

(*1*) *Water temperature gauge.* Place a calibrated thermometer in a container of water and heat the water to a temperature of from 90° to 212°F (32° to 100°C). Place the water temperature gauge sensing bulb in the water and observe temperature reading on gauge compared to the thermometer reading. The temperatures should be within plus or minus two percent; if not, water temperature gauge is faulty and shall be replaced.

(*2*) *Temperature shutdown switch.* Attach leads from an ohmmeter to the terminals of the shutdown switch. Heat a container of water and use a calibrated thermometer to check temperature of the heated liquid. Immerse the sensing probe of the shutdown switch in the heated liquid. The shutdown switch is normally closed and designed to open at temperature of 215°F, plus or minus 5°F. Reading on ohmmeter should be zero until this temperature is reached at which time reading will be infinity, indicating switch has opened. When switch opens, check temperature reading on the thermometer. If the switch has opened within the design temperature setting, lower the temperature of the heated liquid, observing the ohmmeter. The switch should close at approximately 20° differential from opening; ohmmeter reading returning to zero. If the shutdown switch does not operate properly, it shall be replaced. Disconnect ohmmeter leads and remove the shutdown switch from test setup.

e. Installation. Install the water temperature shutdown switch in the engine cylinder head next to the instrument panel. Connect the two wires to the switch terminals (refer to wiring diagram, figure 1-3). Install the water temperature sensing unit in the cylinder head on the flywheel end of the engine. Service the radiator as shown in figure 3-6. Install radiator cap.

Section XVII. MAINTENANCE OF ENGINE ROCKER ARM GROUP

4-49. General. Maintenance of the engine rocker arm group at Organizational level, is limited to checking and adjustment of the valve stem-to-rocker arm clearance.

4-50. Engine Rocker Arm.

a. Checking Clearance (Warm Engine).

(1) Start the engine and allow to run until operating temperature is achieved.

(2) Remove nuts and washers that secure cylinder head cover, remove cover and gasket.

(3) With engine running at slow idle, check the clearance between each rocker arm and the end of valve stems using a 0.015-inch feeler gauge (0.38 mm) as shown in figure 4-32.

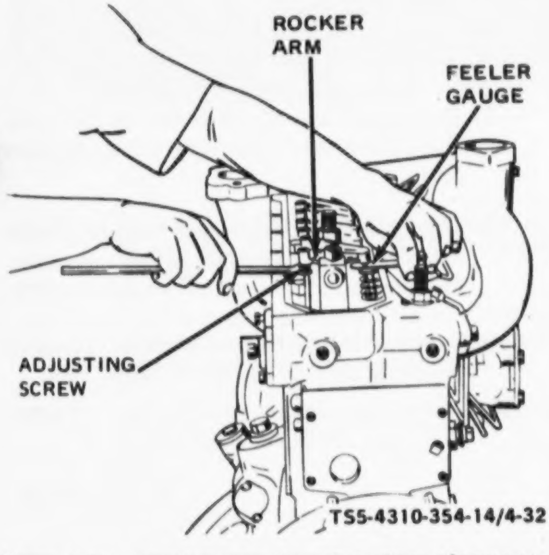


Figure 4-32. Rocker arm-to-valve stem clearance, checking and adjustment.

(4) When properly adjusted, there will be a slight drag on the feeler gauge when the valve is in the unoperated (closed) position.

b. Checking Clearance (Cold Engine).

(1) Remove nuts and washers that secure cylinder head cover, remove cover and gasket.

(2) Rotate the engine crankshaft by hand or with the starting motor until both intake and exhaust valves of number 1 cylinder are fully closed. The valves are fully closed when number 1 cylinder is at top dead center.

(3) Use a 0.016 or 0.017-inch feeler gauge (0.40-0.43 mm) and check clearance as shown in figure 4-32.

(4) When properly adjusted, there should be a slight pull when removing feeler gauge.

(5) Check remaining valve clearances in the same manner in the cylinder firing order of 1, 2, 4, 3 by rotating crankshaft in normal rotation direction.

(6) After all valves have been adjusted as specified in para 4-50.*c* below, recheck clearance as instructed for warm engine, para 4-50.*a*.

c. Rocker Arm Adjustment.

(1) Adjust setting of adjusting screw so that a slight drag on feeler gauge is felt while checking clearance as shown in figure 4-32 and outlined in para 4-50.*a* and 4-50.*b* above.

(2) The adjusting screws are self-locking and require no lock nuts.

(3) Repeat adjustment procedure for all valves, intake and exhaust. All valves have the same clearance.

(4) After checking and adjustment is complete, reinstall cover gasket (new gasket as necessary), cylinder head cover, and secure with washers and nuts.

Section XVIII. MAINTENANCE OF INSTRUMENT PANEL GROUP

4-51. General. The instrument panel group consists of the unit controls and gauges that are mounted on the instrument panel assembly. The controls and gauges can be categorized into three basic groups: the operation indicating group; unit control group; the safety group. The operation indicating group consists of the gauges that show engine speed in revolutions per minute and elapsed running time, receiver air pressure, compressor oil temperature, engine oil pressure, fuel level, fuel pressure, engine water temperature, and the ammeter. Also, included in this group are the engine and compressor air cleaner restriction indicators and the instrument panel lamp. The unit control group consists of the engine idle control, compressor unloader control, ignition switch, start pushbutton, safety override pushbutton, and the quick start assembly control "T" handle. The safety group consists of the air pressure switch and oil pressure switch mounted on the rear of the instrument panel. Included in the safety group, but not mounted on the instrument panel, are: engine water temperature shutdown switch, engine overspeed switch, compressor oil temperature shutdown switch, and the engine fuel injection pump solenoid.

4-52. Instrument Panel Assembly.

a. Removal.

(1) Disconnect the negative (ground) battery terminal cable clamp and remove clamp from battery terminal; then, disconnect wiring harness leads and fuel level sending unit wire assembly from instrument panel switches and gauges (refer to wiring diagram, figure 1-3). As necessary, tag wi leads as removed to aid in reassembly.

(2) Disconnect air, oil, and fuel pressure hos assemblies from gauge connections.

(3) Disconnect and remove tachometer driv cable from engine and tachometer driv adapter. Remove the adapter fro tachometer-hourmeter.

(4) Drain engine coolant to a level below th cylinder head and remove the water temperature sensing bulb from engine cylinde head.

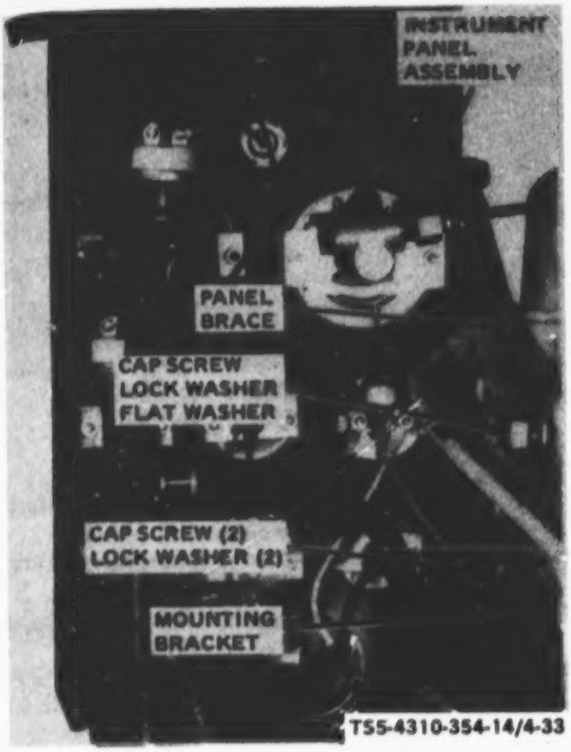
(5) Disconnect and remove the compressor o temperature sensing bulb from air di charge elbow.

(6) Disconnect the two air cleaner restrictio indicator hoses from the restriction indicators.

(7) Disconnect the Quick-Start control cabl from quick start assembly actuating valv lever.

(8) Disconnect the compressor unloader contro cable and the idle control cable as necessar for removal of instrument panel assembly

(9) Remove the instrument panel assembl from the unit as shown in figure 4-33.



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REMOVAL

STEP 1. REMOVE CAP SCREW, LOCK WASHER, AND FLAT WASHER THAT ATTACH PANEL BRACE TO ENGINE.

STEP 2. REMOVE CAP SCREWS AND LOCK WASHERS THAT ATTACH INSTRUMENT PANEL MOUNTING BRACKET TO ENGINE.

STEP 3. REMOVE THE INSTRUMENT PANEL ASSEMBLY FROM THE UNIT.

INSTALLATION

STEP 1. INSTALL THE INSTRUMENT PANEL ASSEMBLY IN POSITION ON UNIT AND ATTACH TO ENGINE WITH LOCK WASHERS AND CAP SCREWS.

STEP 2. ALIGN PANEL BRACE WITH MOUNTING HOLE IN ENGINE.

STEP 3. INSTALL FLAT WASHER BETWEEN ENGINE AND BRACE AND INSTALL LOCK WASHER AND CAP SCREW TO SECURE BRACE TO ENGINE.

Figure 4-33. Instrument panel assembly, removal and installation.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. *Cleaning and Inspection.*

(1) Wipe the instrument panel assembly clean using a cloth dampened with solvent, Federal Specification P-D-680, Type II. Dry thoroughly.

(2) Inspect all instruments and gauges for damage and loose mounting.

(3) Inspect the control cables for kinks, breaks, or any other damage.

(4) Inspect all other parts for cracks, breaks, distortion, deterioration, damaged threads, or any other defect.

c. *Repair.* Repair of the instrument panel assembly is limited to the replacement of any damaged component. Refer to figure 4-34 for component removal and installation.

d. *Installation.*

(1) Install the instrument panel assembly on the unit as shown in figure 4-33.

(2) Connect the idle control cable and compressor unloader control cable.

(3) Connect the Quick-Start control cable to the quick start assembly actuating valve lever.

(4) Connect the two air cleaner restriction indicator hoses to the indicators.

(5) Install the compressor oil temperature sensing bulb in the air discharge elbow.

(6) Install the engine water temperature sensing bulb in the engine cylinder head. Service the radiator as shown in figure 3-6.

(7) Install the tachometer drive adapter on the tachometer-hourmeter. Connect the tachometer drive cable to the adapter and to the engine.

(8) Connect the fuel, oil, and air pressure hoses to their respective gauge connections.

(9) Connect the fuel level sending unit wire assembly to fuel level gauge. Connect wiring harness leads to instrument panel gauges and switches (refer to figure 1-3). Connect the ground cable clamp to battery negative terminal.

4-53. Air Cleaner Restriction Indicators.

a. Removal. Unscrew and remove the engine and/or compressor air cleaner restriction indicator as shown in A, figure 4-34.

b. Cleaning and Inspection.

(1) Wipe the indicator with a clean, dry cloth.

(2) Inspect for any cracks, breaks, thread damage, and function of the reset on top of the indicator.

(3) Inspect safety filter fitting for any damage.

c. Installation.

(1) As necessary, install safety filter fitting panel with filter end of fitting toward in cator.

(2) Install engine and/or compressor air clean restriction indicator as shown in A, figu 4-34.

4-54. Panel Lamp Assembly and Switch.

a. Removal. Remove the panel lamp assembly a switch as shown in A, figure 4-34.

b. Cleaning and Inspection.

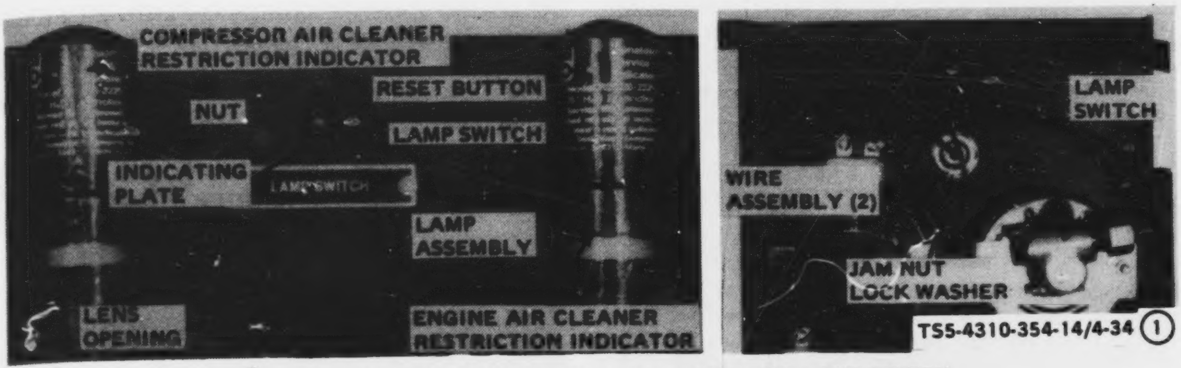
(1) Wipe the panel lamp assembly and swit with a clean, dry cloth.

(2) Check the switch for proper operation. I spect switch terminals for cracks, breaks, any other damage.

(3) Inspect the panel lamp lens and bulb f breakage, cracks, or any other defect.

(4) Inspect attaching hardware for damag threads, or any other defect.

c. Installation. Install the panel lamp assembl and switch as shown in A, figure 4-34.


COMPRESSOR AIR CLEANER RESTRICTION INDICATOR
RESET BUTTON
NUT
LAMP SWITCH
INDICATING PLATE
LAMP SWITCH
LAMP ASSEMBLY
LENS OPENING
ENGINE AIR CLEANER RESTRICTION INDICATOR
LAMP SWITCH
WIRE ASSEMBLY (2)
JAM NUT
LOCK WASHER
TS5-4310-354-14/4-34 ①

A RESTRICTION INDICATORS, PANEL LAMP, AND LAMP SWITCH

RESTRICTION INDICATORS

REMOVAL

STEP 1. UNSCREW AND REMOVE RESTRICTION INDICATORS FROM INSTRUMENT PANEL.

STEP 2. AS NECESSARY, UNSCREW AND REMOVE SAFETY FILTER FITTING.

INSTALLATION

STEP 1. AS NECESSARY, INSTALL SAFETY FILTER FITTING WITH FILTER END TOWARD THE INDICATOR.

STEP 2. INSTALL RESTRICTION INDICATOR IN VERTICAL POSITION ON INSTRUMENT PANEL.

STEP 3. PRESS RESET BUTTON ON TOP OF INDICATOR TO SHOW GREEN IN INDICATING WINDOW.

PANEL LAMP AND SWITCH

REMOVAL

STEP 1. DISCONNECT WIRE ASSEMBLIES FROM LAMP SWITCH.

STEP 2. REMOVE JAM NUT AND LOCK WASHER AND REMOVE PANEL LAMP ASSEMBLY.

STEP 3. REMOVE NUT, INDICATING PLATE, AND LAMP SWITCH.

INSTALLATION

STEP 1. INSTALL LAMP SWITCH AND INDICATING PLATE ON INSTRUMENT PANEL AND SECURE WITH NUT.

STEP 2. INSTALL PANEL LAMP ASSEMBLY ON INSTRUMENT PANEL WITH LENS OPENING FACING THE GAUGES. SECURE WITH LOCK WASHER AND JAM NUT.

STEP 3. CONNECT WIRE ASSEMBLIES TO LAMP SWITCH. (REFER TO WIRING DIAGRAM, FIG 1-3.)

Figure 4-34. Instrument panel controls, instruments, and gauges, removal and installation (sheet 1 of 7).

4-55. Receiver Pressure Gauge.

a. Removal. Remove the receiver pressure gauge as shown in B, figure 4-34.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. Cleaning and Inspection.

(1) Clean the receiver pressure gauge with a cloth dampened with solvent, Federal Specification P-D-680, Type II. Dry thoroughly.

(2) Inspect the gauge face glass for any damage. Inspect the case for cracks, distortion, and damaged threads.

(3) Inspect attaching hardware for distortion, damaged threads, or any other defect.

c. Installation. Install receiver pressure gauge as shown in B, figure 4-34.

4-56. Compressor Oil Temperature Gauge.

a. Removal. Remove the compressor oil temperature gauge as shown in C, figure 4-34.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-138°F (38°C-59°C).

b. Cleaning and Inspection.

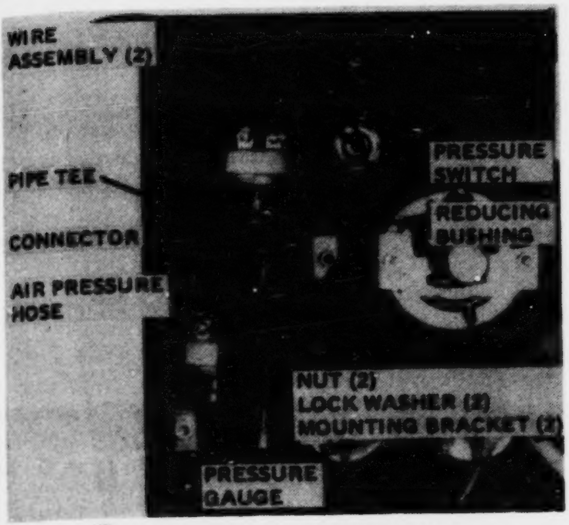
(1) Wipe the gauge, cable, and sensing bulb with a cloth dampened with solvent, Federal Specification P-D-680, Type II. Dry thoroughly.

(2) Inspect the gauge face glass for any damage. Inspect the case for cracks, distortion, or any other damage.

(3) Inspect the sensing bulb and cable for kinks, breaks, distortion of bulb, damaged threads, or any other defect.

(4) Inspect mounting hardware for distortion, damaged threads, and any other damage.

c. Installation. Install the compressor oil temperature gauge as shown in C, figure 4-34.


WIRE ASSEMBLY (2)
PIPE TEE
CONNECTOR
AIR PRESSURE HOSE
PRESSURE SWITCH
REDUCING BUSHING
NUT (2)
LOCK WASHER (2)
MOUNTING BRACKET (2)
PRESSURE GAUGE

B RECEIVER PRESSURE GAUGE

REMOVAL

STEP 1. DISCONNECT AIR PRESSURE HOSE FROM CONNECTOR. DISCONNECT WIRE ASSEMBLIES FROM PRESSURE SWITCH. REINSTALL SCREWS IN PRESSURE SWITCH TERMINALS TO PREVENT THEIR LOSS.

STEP 2. UNSCREW AND REMOVE THE PRESSURE SWITCH, REDUCING BUSHING, HOSE CONNECTOR, AND TEE FROM GAUGE.

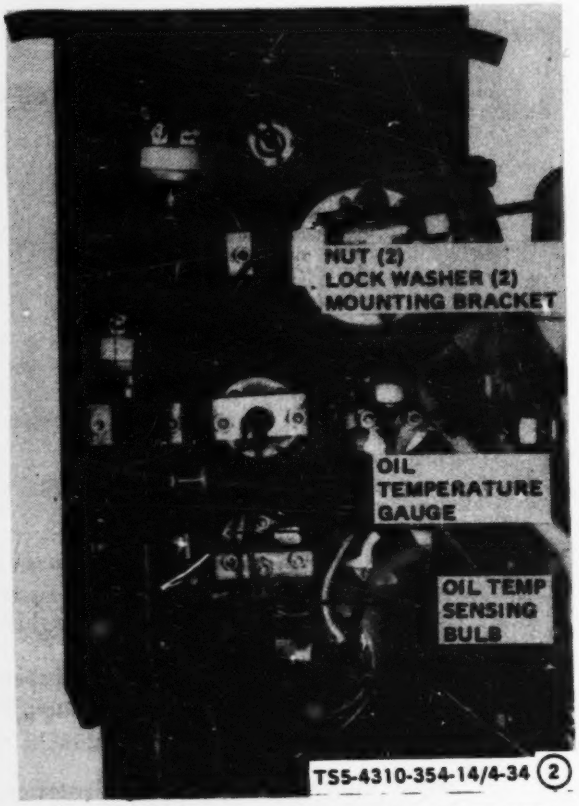
STEP 3. REMOVE NUTS, LOCK WASHERS, MOUNTING BRACKET; REMOVE RECEIVER PRESSURE GAUGE FROM INSTRUMENT PANEL.

INSTALLATION

STEP 1. POSITION RECEIVER PRESSURE GAUGE ON INSTRUMENT PANEL AND SECURE WITH MOUNTING BRACKET, LOCK WASHERS, AND NUTS.

STEP 2. INSTALL TEE ON GAUGE WITH BRANCH FACING UPWARD, INSTALL REDUCING BUSHING AND PRESSURE SWITCH IN BRANCH. INSTALL HOSE CONNECTOR IN RUN OF TEE.

STEP 3. CONNECT WIRE ASSEMBLIES TO PRESSURE SWITCH TERMINALS (REFER TO WIRING DIAGRAM, FIG 1-3). CONNECT AIR PRESSURE HOSE TO CONNECTOR IN TEE.


NUT (2)
LOCK WASHER (2)
MOUNTING BRACKET
OIL TEMPERATURE GAUGE
OIL TEMP SENSING BULB
TS5-4310-354-14/4-34 ②

C COMPRESSOR OIL TEMPERATURE GAUGE

REMOVAL

STEP 1. REMOVE COMPRESSOR OIL TEMPERATURE SENSING BULB FROM COMPRESSOR DISCHARGE ELBOW.

STEP 2. REMOVE NUTS, LOCK WASHERS, AND MOUNTING BRACKET. REMOVE COMPRESSOR OIL TEMPERATURE GAUGE FROM INSTRUMENT PANEL.

INSTALLATION

STEP 1. INSTALL COMPRESSOR OIL TEMPERATURE GAUGE ON INSTRUMENT PANEL. SECURE WITH MOUNTING BRACKET, LOCK WASHERS, AND NUTS.

STEP 2. INSTALL COMPRESSOR OIL TEMPERATURE SENSING BULB IN COMPRESSOR DISCHARGE ELBOW.

Figure 4-34. Instrument panel controls, instruments, and gauges, removal and installation (sheet 2 of 7).

4-57. Engine Oil Pressure Gauge.

a. Removal. Remove the engine oil pressure gauge as shown in D, figure 4-34.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. Cleaning and Inspection.

(1) Wipe the engine oil pressure gauge with a cloth dampened with solvent, Federal Specification P-D-680, Type II. Dry thoroughly.

(2) Inspect gauge face glass for damage. Inspect case for cracks, distortion, damaged threads, or any other defect.

(3) Inspect attaching hardware for distortion, damaged threads, or any other defect.

c. Installation. Install the engine oil pressure gauge as shown in D, figure 4-34.

4-58. Fuel Level Gauge.

a. Removal. Disconnect battery ground cable and remove the fuel level gauge and, as necessary, the fuel level sending unit as shown in E, figure 4-34.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. Cleaning and Inspection.

(1) Wipe the fuel level gauge and sending uni with a cloth dampened with solvent, Federal Specification P-D-680, Type II. Dr thoroughly.

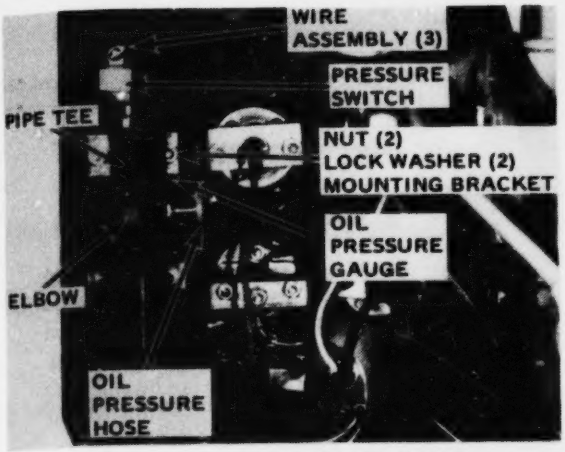
(2) Inspect the gauge face for damage. Inspec case for cracks, distortion, terminal threa damage, or any other defect.

(3) Inspect sending unit float for freedom o movement. Inspect for terminal thread damage, cracks, distortion, or any other defect.

(4) Inspect attaching hardware for distortion, damaged threads, or any other defect.

c. Testing. While holding fuel level gauge in your hand, use an ohmmeter to test the gauge. With ohmmeter test lead connected to any terminal a reading of zero ohms should be indicated. Any other reading on the ohmmeter scale indicates a defective gauge.

d. Installation. Install the fuel level gauge and, as necessary, install the fuel level sending unit as shown in E, figure 4-34. Connect the battery ground cable.


WIRE ASSEMBLY (3)
PRESSURE SWITCH
PIPE TEE
NUT (2)
LOCK WASHER (2)
MOUNTING BRACKET
OIL PRESSURE GAUGE
ELBOW
OIL PRESSURE HOSE

D ENGINE OIL PRESSURE GAUGE

REMOVAL

STEP 1. DISCONNECT ENGINE OIL PRESSURE HOSE FROM ELBOW ON BACK OF GAUGE. REMOVE THE ELBOW.

STEP 2. DISCONNECT WIRE ASSEMBLIES FROM OIL PRESSURE SWITCH TERMINALS. REINSTALL SCREWS AND LOCK WASHERS IN SWITCH TERMINALS TO PREVENT THEIR LOSS.

STEP 3. UNSCREW AND REMOVE OIL PRESSURE SWITCH FROM TEE. REMOVE TEE FROM GAUGE.

STEP 4. REMOVE NUTS, LOCK WASHER, AND MOUNTING BRACKET. REMOVE THE ENGINE OIL PRESSURE GAUGE FROM INSTRUMENT PANEL.

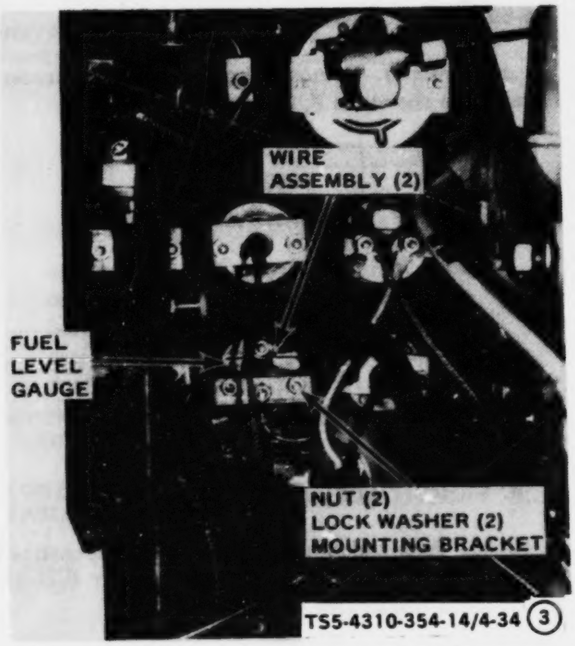
INSTALLATION

STEP 1. INSTALL ENGINE OIL PRESSURE GAUGE ON INSTRUMENT PANEL AND SECURE WITH MOUNTING BRACKET, LOCK WASHERS, AND NUTS.

STEP 2. INSTALL BRANCH OF TEE ON GAUGE WITH RUN OF TEE IN VERTICAL POSITION. INSTALL OIL PRESSURE SWITCH IN TOP OF TEE. INSTALL OIL PRESSURE HOSE ELBOW IN BOTTOM OF TEE.

STEP 3. CONNECT WIRE ASSEMBLIES TO PRESSURE SWITCH TERMINALS. (REFER TO WIRING DIAGRAM, FIG 1-3.)

STEP 4. CONNECT ENGINE OIL PRESSURE HOSE TO ELBOW ON BOTTOM OF TEE.


WIRE ASSEMBLY (2)
FUEL LEVEL GAUGE
NUT (2)
LOCK WASHER (2)
MOUNTING BRACKET
TS5-4310-354-14/4-34 ③

E FUEL LEVEL GAUGE AND SENDING UNIT

REMOVAL

STEP 1. DISCONNECT AND REMOVE FUEL LEVEL GAUGE AND SENDING UNIT WIRE ASSEMBLIES.

STEP 2. REMOVE NUTS, LOCK WASHERS, AND MOUNTING BRACKET. REMOVE FUEL LEVEL GAUGE FROM INSTRUMENT PANEL.

STEP 3. AS NECESSARY, REMOVE SCREWS, LOCK WASHERS, AND FUEL LEVEL SENDING UNIT, WITH GASKET, FROM FUEL TANK.

INSTALLATION

STEP 1. AS NECESSARY, INSTALL GASKET AND FUEL LEVEL SENDING UNIT IN FUEL TANK. SECURE WITH LOCK WASHERS AND SCREWS.

STEP 2. INSTALL FUEL LEVEL GAUGE ON INSTRUMENT PANEL AND SECURE WITH MOUNTING BRACKET, LOCK WASHERS, AND NUTS.

STEP 3. CONNECT THE WIRE ASSEMBLIES TO FUEL LEVEL GAUGE AND FUEL LEVEL SENDING UNIT. (REFER TO WIRING DIAGRAM, FIG 1-3.)

Figure 4-34. Instrument panel controls, instruments, and gauges, removal and installation (sheet 3 of 7).

4-59. Engine Fuel Pressure Gauge.

a. Removal. Remove the engine fuel pressure gauge as shown in F, figure 4-34.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. Cleaning and Inspection.

(1) Wipe the gauge with a cloth dampened with solvent, Federal Specification P-D-680, Type II. Dry thoroughly.

(2) Inspect the gauge face for damage. Inspect case for distortion, cracks, or any other defect.

(3) Inspect attaching hardware for distortion, damaged threads, or any other defect.

c. Installation. Install the engine fuel pressure gauge as shown in F, figure 4-34.

4-60. Quick-Start Control Cable.

a. Removal. Remove the Quick-Start control cable as shown in G, figure 4-34.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-138°F (38°C-59°C).

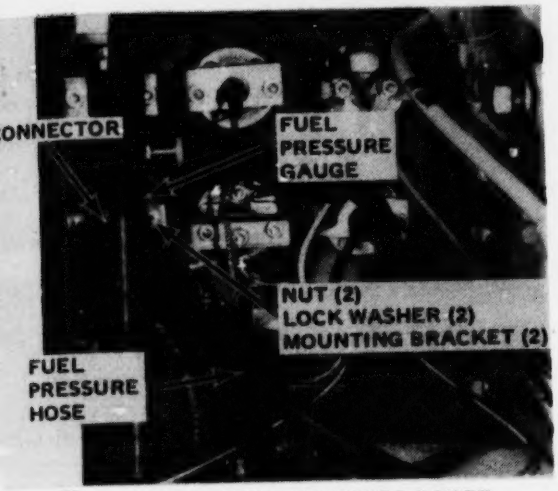
b. Cleaning and Inspection.

(1) Clean the control cable with solvent, Federal Specification P-D-680, Type II. Dry thoroughly.

(2) Inspect the control cable for breaks, kinks, or any other defect.

(3) Inspect attaching hardware for distortion, damaged threads, or any other defect.

c. Installation. Install the Quick-Start control cable as shown in G, figure 4-34.


ONNECTOR
FUEL PRESSURE GAUGE
NUT (2)
LOCK WASHER (2)
MOUNTING BRACKET (2)
FUEL PRESSURE HOSE

F ENGINE FUEL PRESSURE GAUGE

REMOVAL

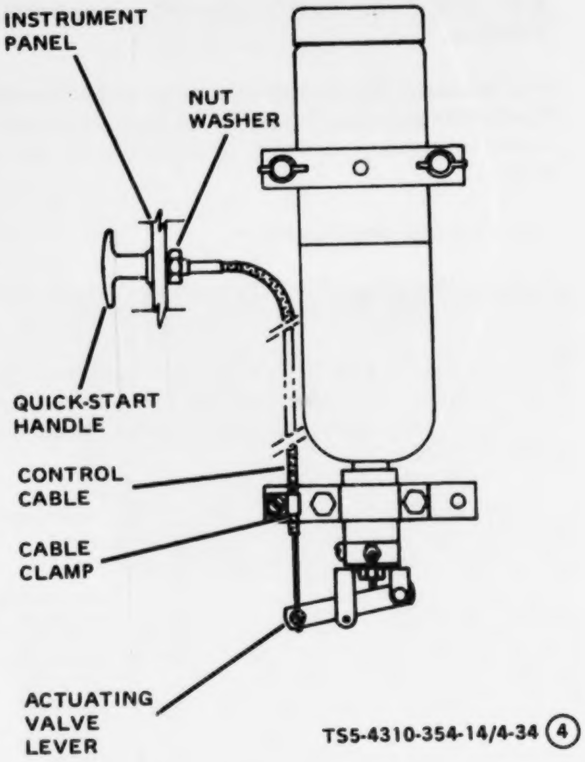
STEP 1. DISCONNECT FUEL PRESSURE HOSE FROM CONNECTOR ON GAUGE. REMOVE THE CONNECTOR.

STEP 2. REMOVE NUTS, LOCK WASHERS, AND MOUNTING BRACKETS. REMOVE FUEL PRESSURE GAUGE FROM INSTRUMENT PANEL.

INSTALLATION

STEP 1. INSTALL FUEL PRESSURE GAUGE ON INSTRUMENT PANEL AND SECURE WITH MOUNTING BRACKETS, LOCK WASHERS, AND NUTS.

STEP 2. INSTALL FUEL PRESSURE HOSE CONNECTOR ON GAUGE AND CONNECT THE FUEL PRESSURE HOSE.


INSTRUMENT PANEL
NUT
WASHER
QUICK-START HANDLE
CONTROL CABLE
CABLE CLAMP
ACTUATING VALVE LEVER

TS5-4310-354-14/4-34 ④

G QUICK-START CONTROL CABLE

REMOVAL

STEP 1. DISCONNECT QUICK-START CONTROL CABLE FROM ACTUATING VALVE LEVER. LOOSEN CABLE CLAMP AND REMOVE CABLE FROM CLAMP.

STEP 2. UNSCREW NUT SECURING HANDLE TO INSTRUMENT PANEL. REMOVE HANDLE AND CABLE FROM INSTRUMENT PANEL. REMOVE NUT AND WASHER.

INSTALLATION

STEP 1. INSTALL HANDLE ON INSTRUMENT PANEL BY RUNNING CABLE THROUGH HOLE IN PANEL AND THROUGH WASHER AND MOUNTING NUT. SECURE HANDLE TO PANEL WITH NUT.

STEP 2. INSTALL CABLE THROUGH CABLE CLAMP ON ACTUATING VALVE ASSEMBLY. TIGHTEN CABLE CLAMP, AND CONNECT ACTUATING WIRE TO VALVE ASSEMBLY LEVER.

Figure 4-34. Instrument panel controls, instruments, and gauges, removal and installation (sheet 4 of 7).

4-61. Start and Safety Override Pushbutton Switches.

a. Removal. Disconnect battery ground cable and remove the start pushbutton switch and/or the safety override pushbutton switch as shown in H, figure 4-34.

b. Cleaning and Inspection.

(1) Wipe the safety switch and start switch with a clean, dry cloth.

(2) Check switches for proper operation. Inspect for damaged terminals, cracks, breaks, damaged threads, or any other defect.

(3) Inspect attaching hardware for distortion, damaged threads or any other defect.

c. Installation. Install the start pushbutton switch and/or the safety override pushbutton switch as shown in H, figure 4-34. Connect the battery ground cable.

4-62. Ignition On-Off Switch.

a. Removal. Disconnect the battery ground cal and remove the ignition on-off switch as shown in figure 4-34.

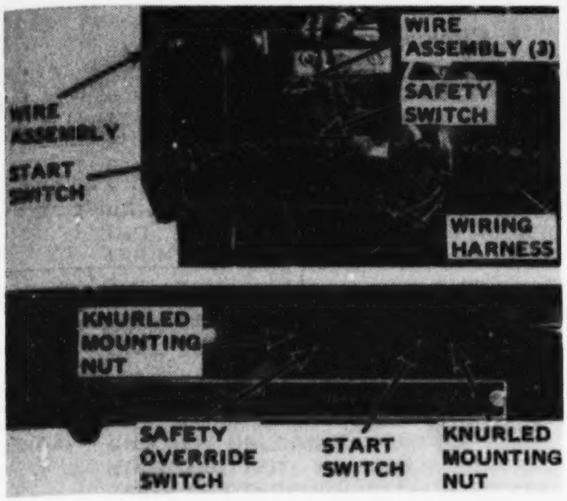
b. Cleaning and Inspection.

(1) Wipe the ignition on-off switch with a clean dry cloth.

(2) Inspect the switch for proper operation. Inspect for damaged terminal, cracks, breaks, damaged threads, or any other defect.

(3) Inspect attaching hardware for distortion, damaged threads, or any other defect.

c. Installation. Install the ignition on-off switch as shown in I, figure 4-34. Connect the battery ground cable.


WIRE ASSEMBLY (3)
WIRE ASSEMBLY
SAFETY SWITCH
START SWITCH
WIRING HARNESS
KNURLED MOUNTING NUT
SAFETY OVERRIDE SWITCH
START SWITCH
KNURLED MOUNTING NUT

H START PUSHBUTTON AND SAFETY OVERRIDE PUSHBUTTON SWITCHES

REMOVAL

STEP 1. DISCONNECT WIRE ASSEMBLY AND WIRING HARNESS LEAD FROM START SWITCH.

STEP 2. REMOVE KNURLED MOUNTING NUT FROM FRONT OF INSTRUMENT PANEL AND REMOVE THE START PUSHBUTTON SWITCH.

STEP 3. DISCONNECT SAFETY OVERRIDE PUSHBUTTON SWITCH WIRE ASSEMBLIES FROM IGNITION SWITCH AND BOTH TERMINALS OF OIL PRESSURE SWITCH.

STEP 4. REMOVE KNURLED MOUNTING NUT FROM FRONT OF INSTRUMENT PANEL AND REMOVE SAFETY OVERRIDE PUSHBUTTON SWITCH, WITH WIRE ASSEMBLIES ATTACHED. AS NECESSARY, REMOVE THE WIRE ASSEMBLIES.

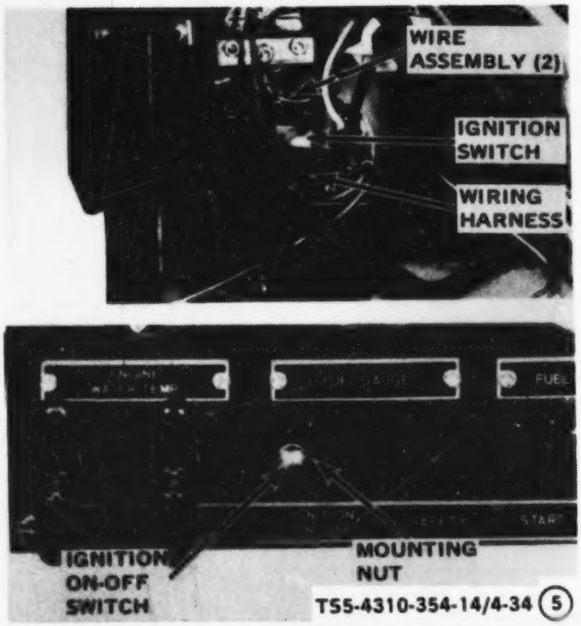
INSTALLATION

STEP 1. AS NECESSARY, CONNECT WIRE ASSEMBLIES TO SAFETY OVERRIDE PUSHBUTTON SWITCH BEFORE INSTALLING SWITCH ON INSTRUMENT PANEL. (REFER TO WIRING DIAGRAM, FIG 1-3).

STEP 2. INSTALL SAFETY OVERRIDE SWITCH ON INSTRUMENT PANEL AND SECURE WITH KNURLED MOUNTING NUT. CONNECT WIRE ASSEMBLIES TO OIL PRESSURE SWITCH TERMINALS AND TO IGNITION SWITCH TERMINAL. (REFER TO FIG 1-3.)

STEP 3. INSTALL START PUSHBUTTON SWITCH ON INSTRUMENT PANEL AND SECURE WITH KNURLED MOUNTING NUT.

STEP 4. CONNECT WIRING HARNESS LEAD AND WIRE ASSEMBLY TO START SWITCH. (REFER TO FIG 1-3.)


WIRE ASSEMBLY (2)
IGNITION SWITCH
WIRING HARNESS
ENGINE WATER TEMP
FUEL
IGNITION ON-OFF SWITCH
MOUNTING NUT
TS5-4310-354-14/4-34 ⑤

I IGNITION ON-OFF SWITCH

REMOVAL

STEP 1. DISCONNECT WIRING HARNESS LEAD AND WIRE ASSEMBLIES FROM IGNITION ON-OFF SWITCH TERMINALS.

STEP 2. REMOVE MOUNTING NUT FROM FRONT OF INSTRUMENT PANEL AND REMOVE THE IGNITION ON-OFF SWITCH.

INSTALLATION

STEP 1. INSTALL IGNITION ON-OFF SWITCH ON INSTRUMENT PANEL AND SECURE WITH MOUNTING NUT.

STEP 2. CONNECT WIRE ASSEMBLIES AND WIRING HARNESS LEAD TO SWITCH TERMINALS. (REFER TO WIRING DIAGRAM, FIG 1-3.)

Figure 4-34. Instrument panel controls, instruments, and gauges, removal and installation (sheet 5 of 7).

4-63. Control Cables.

a. Removal. Remove the idle control cable and/or the compressor unloader control cable as shown in J, figure 4-34.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. Cleaning and Inspection.

(1) Clean the control cables with solvent,
eral Specification P-D-680, Type II.
thoroughly.

(2) Inspect cables for breaks, kinks, or
other defect.

(3) Inspect attaching parts for distortion,
aged threads, or any other defect.

c. Installation. Install the idle control cable a
compressor unloader control cable as shown
figure 4-34.

REMOVAL

STEP 1. REMOVE WIRE STOP FROM END OF IDLE CONTROL CABLE ACTUATING WIRE. LOOSEN CABLE CLAMP AND REMOVE CONTROL CABLE FROM CLAMP.

STEP 2. UNSCREW IDLE CONTROL CABLE MOUNTING NUT. WITHDRAW CONTROL CABLE OUT THROUGH INSTRUMENT PANEL, MOUNTING WASHER, AND NUT.

STEP 3. STRAIGHTEN END OF COMPRESSOR UNLOADER CONTROL CABLE ACTUATING WIRE. LOOSEN WIRE STOP ON UNLOADER LEVER, LOOSEN CABLE CLAMP, WITHDRAW CABLE FROM CLAMP.

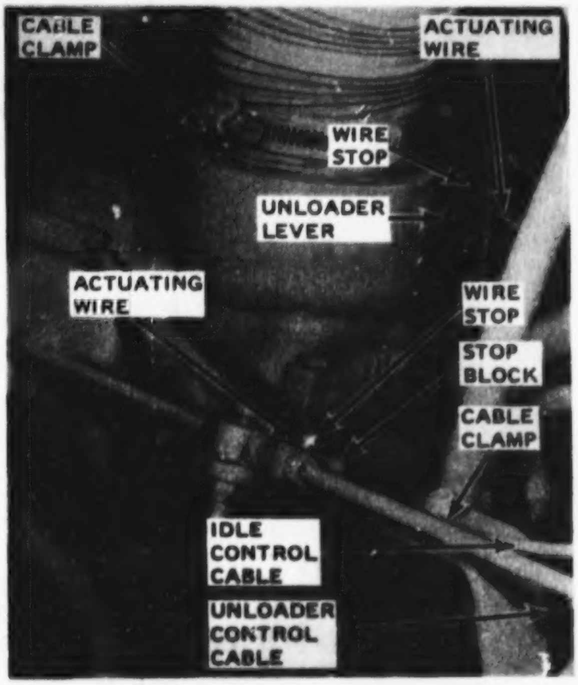
STEP 4. UNSCREW UNLOADER CONTROL CABLE MOUNTING NUT. WITHDRAW CONTROL CABLE OUT THROUGH INSTRUMENT PANEL, MOUNTING WASHER, AND NUT.

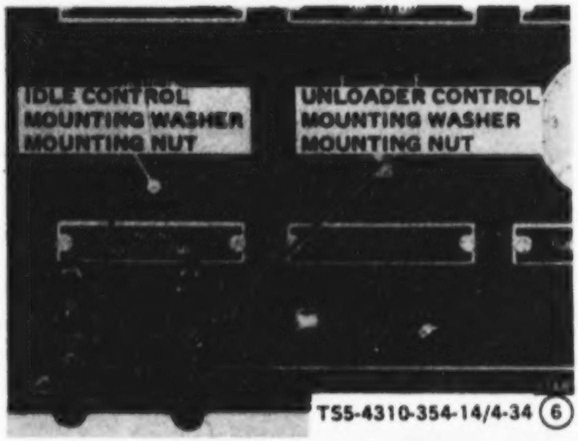
INSTALLATION

STEP 1. RUN THE COMPRESSOR UNLOADER CONTROL CABLE THROUGH HOLE IN INSTRUMENT PANEL, THROUGH MOUNTING WASHER, AND NUT. SECURE UNLOADER CONTROL CABLE TO INSTRUMENT PANEL, WITH LOCKED HANDLE IN VERTICAL POSITION, BY TIGHTENING MOUNTING NUT.

STEP 2. INSTALL UNLOADER CONTROL CABLE THROUGH CABLE CLAMP WITH CABLE ACTUATING WIRE THROUGH WIRE STOP. SECURE CABLE BY TIGHTENING CABLE CLAMP. MOVE UNLOADER SHAFT LEVER AGAINST STOP PIN TO CLOSE INTAKE VALVE PLATE FULLY. BEND CONTROL CABLE ACTUATING WIRE APPROXIMATELY 1/2-INCH FROM END. UNLOCK UNLOADER CONTROL HANDLE AND PULL OUT TO UNLOAD POSITION. TIGHTEN WIRE STOP ON INTAKE LEVER TO SECURE ACTUATING WIRE. PUSH IN UNLOADER CONTROL HANDLE AND LOCK. CHECK TO MAKE CERTAIN THAT INTAKE VALVE PLATE IS FULLY OPEN (VERTICAL).

STEP 3. RUN IDLE CONTROL CABLE THROUGH HOLE IN INSTRUMENT PANEL, THROUGH MOUNTING WASHER, AND NUT. SECURE IDLE CONTROL CABLE TO INSTRUMENT PANEL, WITH LOCKED HANDLE IN VERTICAL POSITION, BY TIGHTENING MOUNTING NUT.


CABLE CLAMP
ACTUATING WIRE
WIRE STOP
UNLOADER LEVER
ACTUATING WIRE
WIRE STOP
STOP BLOCK
CABLE CLAMP
IDLE CONTROL CABLE
UNLOADER CONTROL CABLE


IDLE CONTROL
MOUNTING WASHER
MOUNTING NUT
UNLOADER CONTROL
MOUNTING WASHER
MOUNTING NUT

TS5-4310-354-14/4-34 ⑥

J CONTROL CABLES

STEP 4. RUN IDLE CONTROL CABLE THROUGH CABLE CLAMP, CABLE ACTUATING WIRE THROUGH STOP BLOCK, AND INSTALL WIRE STOP ON END OF ACTUATING WIRE. SECURE CONTROL CABLE BY TIGHTENING CABLE CLAMP. AT FULL ENGINE SPEED THERE SHOULD BE APPROXIMATELY 1/8-INCH CLEARANCE BETWEEN WIRE STOP AND STOP BLOCK. (REFER TO SECTION XIX FOR SPEED CONTROL LINKAGE ADJUSTMENT.)

Figure 4-34. Instrument panel controls, instruments, and gauges, removal and installation (sheet 6 of 7).

4-64. Engine Water Temperature Gauge.

a. Removal. Drain coolant from radiator to a level below engine cylinder head; then, remove engine water temperature gauge as shown in K, figure 4-34.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. Cleaning and Inspection.

(1) Clean the gauge, sensing bulb, and connecting cable with a cloth dampened with solvent, Federal Specification P-D-680, Type II. Dry thoroughly.

(2) Inspect gauge face glass for damage. Inspect case for cracks, distortion, or any other defect.

(3) Inspect sensing bulb for damage and connecting cable for kinks, breaks, or any other defect.

(4) Inspect attaching hardware for distortion, damaged threads, or any other defect.

c. Installation. Install the engine water temperature gauge as shown in K, figure 4-34. Service the radiator, figure 3-6.

4-65. Ammeter.

a. Removal. Disconnect battery ground cable and remove the ammeter as shown in L, figure 4-34.

b. Cleaning and Inspection.

(1) Wipe the ammeter with a clean, dry cloth.

(2) Inspect gauge face for damage. Inspect case for cracks, distortion, damaged terminals, or any other defect.

(3) Inspect attaching hardware for distortion, damaged threads, or any other defect.

c. Installation. Install the ammeter as show figure 4-34. Connect battery ground cable.

NOTE

Make certain that ammeter terminals are tightened securely to provide a good charging circuit for the battery. Check wiring diagram, figure 1-3, for proper connections.

4-66. Tachometer — Hourmeter.

a. Removal. Remove the tachometer-hourme shown in M, figure 4-34.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

b. Cleaning and Inspection.

(1) Wipe the tachometer-hourmeter wi cloth dampened with solvent, Federal S ification P-D-680, Type II. Dry thoroug Also, wipe the tachometer drive ada and drive cable in the same manner.

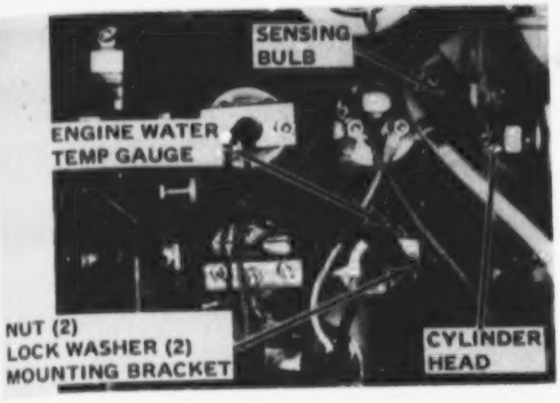
(2) Inspect the gauge face glass for dam Inspect case for cracks, distortion, dama threads, or any other defect.

(3) Inspect drive cable for kinks, breaks, or other defect.

(4) Inspect drive adapter for cracks, bre damaged threads, operation, or any ot defect.

(5) Inspect attaching hardware for distort damaged threads, or any other defect.

c. Installation. Install the tachometer-hourme as shown in M, figure 4-34.


SENSING BULB
ENGINE WATER TEMP GAUGE
NUT (2)
LOCK WASHER (2)
MOUNTING BRACKET
CYLINDER HEAD

K ENGINE WATER TEMPERATURE GAUGE

REMOVAL

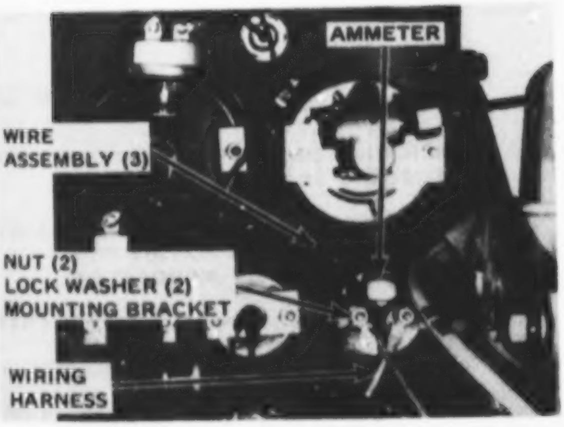
STEP 1. UNSCREW AND REMOVE ENGINE WATER TEMPERATURE SENSING BULB FROM CYLINDER HEAD.

STEP 2. REMOVE NUTS, LOCK WASHERS, AND MOUNTING BRACKET. REMOVE ENGINE WATER TEMPERATURE GAUGE FROM INSTRUMENT PANEL.

INSTALLATION

STEP 1. INSTALL ENGINE WATER TEMPERATURE GAUGE ON INSTRUMENT PANEL. SECURE WITH MOUNTING BRACKET, LOCK WASHERS, AND NUTS.

STEP 2. INSTALL ENGINE WATER TEMPERATURE SENSING BULB IN CYLINDER HEAD.


AMMETER
WIRE ASSEMBLY (3)
NUT (2)
LOCK WASHER (2)
MOUNTING BRACKET
WIRING HARNESS

L AMMETER GAUGE

REMOVAL

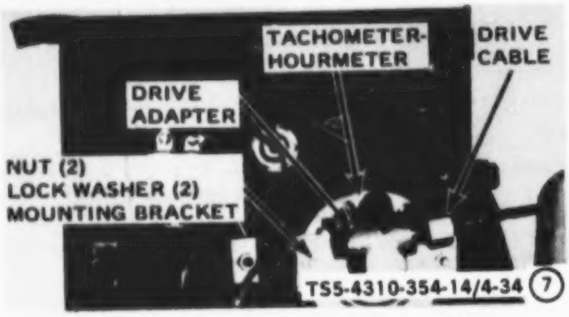
STEP 1. DISCONNECT WIRING HARNESS LEADS AND WIRE ASSEMBLIES FROM AMMETER TERMINALS. REASSEMBLE TERMINAL WASHERS AND NUTS TO PREVENT THEIR LOSS.

STEP 2. REMOVE NUTS, LOCK WASHERS, AND MOUNTING BRACKET. REMOVE AMMETER FROM INSTRUMENT PANEL.

INSTALLATION

STEP 1. INSTALL AMMETER ON INSTRUMENT PANEL. SECURE WITH MOUNTING BRACKET, LOCK WASHERS, AND NUTS.

STEP 2. CONNECT WIRE ASSEMBLIES AND WIRING HARNESS LEADS TO AMMETER TERMINALS. (REFER TO WIRING DIAGRAM, FIG 1-3).


TACHOMETER-HOURMETER
DRIVE CABLE
DRIVE ADAPTER
NUT (2)
LOCK WASHER (2)
MOUNTING BRACKET
TS5-4310-354-14/4-34 ⑦

M TACHOMETER-HOURMETER

REMOVAL

STEP 1. DISCONNECT TACHOMETER DRIVE CABLE. REMOVE TACHOMETER DRIVE ADAPTER.

STEP 2. REMOVE NUTS, LOCK WASHERS, AND MOUNTING BRACKET. REMOVE THE TACHOMETER-HOURMETER FROM INSTRUMENT PANEL.

INSTALLATION

STEP 1. INSTALL TACHOMETER-HOURMETER ON INSTRUMENT PANEL. SECURE WITH MOUNTING BRACKET, LOCK WASHERS, AND NUTS.

STEP 2. INSTALL TACHOMETER DRIVE ADAPTER AND CONNECT DRIVE CABLE.

Figure 4-34. Instrument panel controls, instruments, and gauges, removal and installation (sheet 7 of 7).

4-67. Pressure Switches.

a. Removal. Disconnect battery ground cable and remove the air pressure switch as shown in A, figure 4-35.

b. Cleaning and Inspection.

(1) Wipe the pressure switches with a clean dry cloth.

(2) Inspect terminals for damage, case for distortion, condition of threads, and any other defect.

c. Installation. Install the air pressure switch and/or oil pressure switch as shown in A, figure 4-35. Connect battery ground cable.

4-68. Engine Water Temperature Shutdown Swit

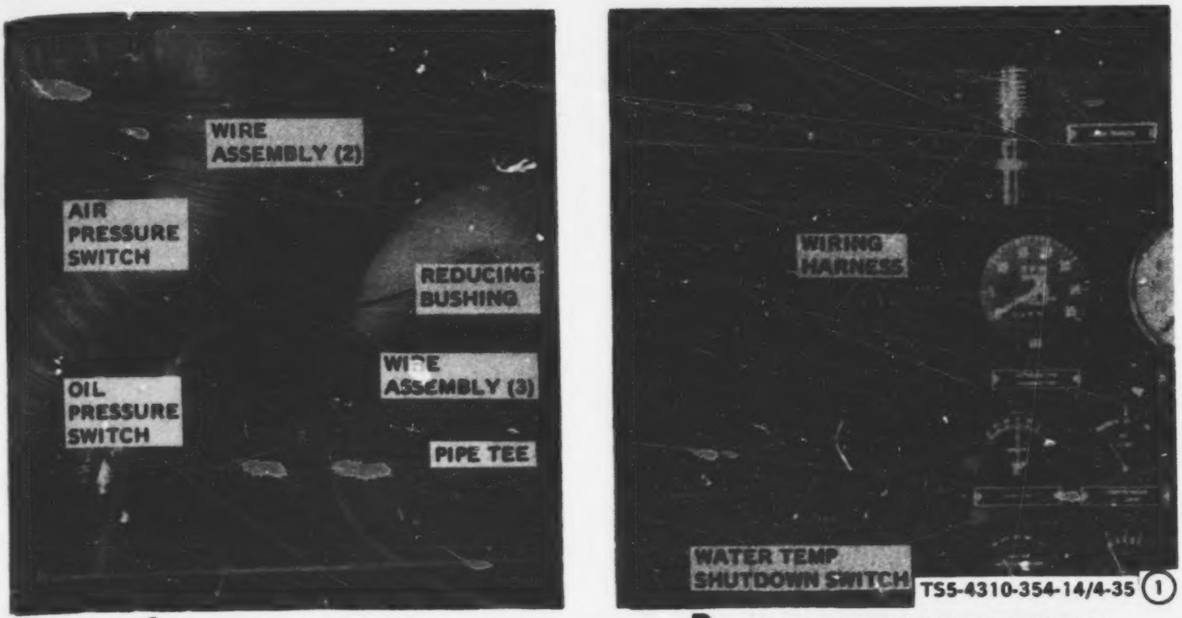
a. Removal. Disconnect battery ground cab
Drain coolant from radiator to a level below the c
inder head. Remove the engine water temperatu
shutdown switch as shown in B, figure 4-35.

b. Cleaning and Inspection.

(1) Wipe the shutdown switch with a clean,
cloth.

(2) Inspect terminals for damage, sensing pro
for distortion, cracks, and breaks, and
damaged threads.

c. Installation. Install the engine water tempe
ture shutdown switch as shown in B, figure 4-
Service the radiator, figure 3-6. Connect the batte
ground cable.


WIRE ASSEMBLY (2)
AIR PRESSURE SWITCH
REDUCING BUSHING
WIRE ASSEMBLY (3)
OIL PRESSURE SWITCH
PIPE TEE
WIRING HARNESS
WATER TEMP SHUTDOWN SWITCH
TS5-4310-354-14/4-35 ①

A PRESSURE SWITCHES

B WATER TEMP SHUTDOWN SWITCH

REMOVAL

STEP 1. DISCONNECT WIRE ASSEMBLIES FROM AIR PRESSURE SWITCH. REASSEMBLE TERMINAL HARDWARE TO PREVENT THEIR LOSS.

STEP 2. UNSCREW AND REMOVE AIR PRESSURE SWITCH FROM REDUCING BUSHING.

STEP 3. DISCONNECT WIRE ASSEMBLIES FROM OIL PRESSURE SWITCH. REASSEMBLE TERMINAL HARDWARE TO PREVENT THEIR LOSS.

STEP 4. UNSCREW AND REMOVE OIL PRESSURE SWITCH FROM TEE.

INSTALLATION

STEP 1. INSTALL OIL PRESSURE SWITCH IN TEE ON BACK OF OIL PRESSURE GAUGE.

STEP 2. CONNECT WIRE ASSEMBLIES TO OIL PRESSURE SWITCH TERMINALS. (REFER TO WIRING DIAGRAM, FIG 1-3.)

STEP 3. INSTALL AIR PRESSURE SWITCH IN REDUCING BUSHING ON BACK OF AIR PRESSURE GAUGE.

STEP 4. CONNECT WIRE ASSEMBLIES TO AIR PRESSURE SWITCH TERMINALS. (REFER TO WIRING DIAGRAM, FIG 1-3.)

REMOVAL

STEP 1. DISCONNECT WIRING HARNESS LEADS FROM SWITCH TERMINALS.

STEP 2. UNSCREW AND REMOVE ENGINE WATER TEMPERATURE SHUTDOWN SWITCH FROM CYLINDER HEAD.

INSTALLATION

STEP 1. INSTALL ENGINE WATER TEMPERATURE SHUTDOWN SWITCH IN CYLINDER HEAD.

STEP 2. CONNECT WIRING HARNESS LEADS TO SWITCH TERMINALS. (REFER TO WIRING DIAGRAM, FIG 1-3.)

Figure 4-35. Safety switches, removal and installation (sheet 1 of 2).

4-69. Engine Overspeed Switch.

a. Removal. Disconnect the battery ground cable and remove the overspeed switch transmitter unit as shown in C, figure 4-35. Remove the overspeed switch assembly as shown in figure 4-14.

b. Testing. Off-unit testing of the overspeed switch transmitter and overspeed switch is as follows:

(1) With transmitter removed from the engine and the transmitter leads disconnected from the switch, using your fingers, check for free turning of the transmitter drive tip.

(2) Attach an ohmmeter across the two transmitter leads. Turn the transmitter drive tip. For each revolution of the drive tip there should be four zero resistance (on) and four resistance (off) events indicated on the ohmmeter. If there are less than four on/off events, or the transmitter shows on or off only, it is not functioning properly and shall be replaced.

(3) To test the overspeed switch, remove the four cover screws, noting a green tape which indicates cover position for assembly. The tape is an assembly reminder so that cover will not be reversed; thereby, reversing terminal labels.

(4) Make certain that the shorting bars across the two terminals labelled "TACH" are secure. Apply a 12 VDC (minimum) power source having a minimum of 400 ma to power terminals, noting polarity requirement. When power is turned on the relay coil should close, actuating the microswitch mounted under the coil arm. If the coil fails to actuate, a circuit failure is indicat
replacement of the switch is require

(5) To test the switch for trip function, c
leads from a good transmitter to the s
Drive the transmitter with an electri
drill motor capable of producing spee
least 2250 rpm. When the transmi
driven over 2250 rpm, the switch rela
open. After overspeed trip test, press
button on circuit board to reset rela
closed mode.

(6) After testing, install overspeed s
cover, aligning tape (see para 4-69
above), and secure with four cover sc

c. Installation. Install the overspeed switc
sembly as shown in figure 4-14. Install the over
switch transmitter as shown in C, figure 4-35.
nect the battery ground cable.

4-70. Compressor Oil Temperature Shutd Switch.

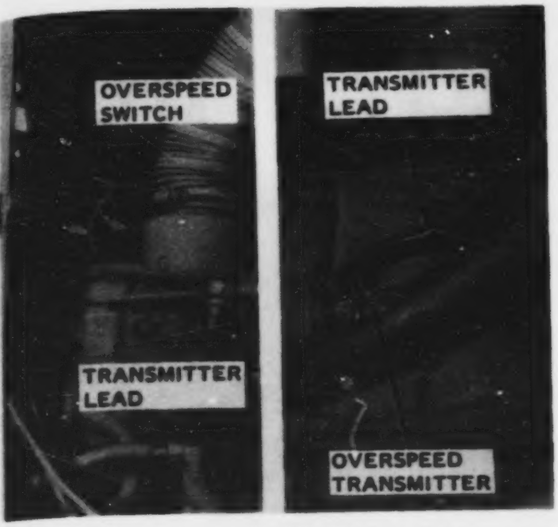
a. Removal. Disconnect the battery ground
and remove the compressor oil temperature
down switch as shown in D, figure 4-35.

b. Cleaning and Inspection.

(1) Wipe the shutdown switch with a clean
cloth.

(2) Inspect the temperature probe for di
tion, cracks, breaks, damaged threads,
condition of plug connectors.

c. Installation. Install the compressor oil temp
ture shutdown switch as shown in D, figure 4-3


OVERSPEED SWITCH
TRANSMITTER LEAD
TRANSMITTER LEAD
OVERSPEED TRANSMITTER

C ENGINE OVERSPEED SWITCH

REMOVAL

STEP 1. DISCONNECT THE OVERSPEED SWITCH TRANSMITTER LEADS FROM ENGINE OVERSPEED SWITCH TERMINALS.

STEP 2. UNSCREW AND REMOVE OVERSPEED TRANSMITTER FROM ENGINE.

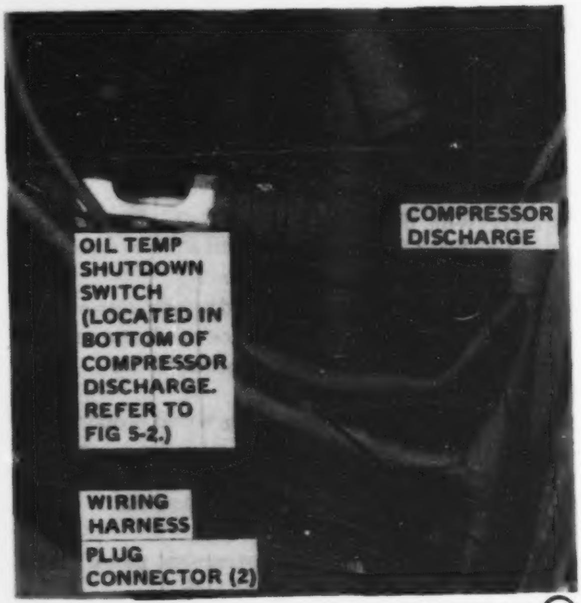
NOTE

REFER TO FIGURE 4-14 FOR REMOVAL AND INSTALLATION OF ENGINE OVERSPEED SWITCH ASSEMBLY.

INSTALLATION

STEP 1. INSTALL THE ENGINE OVERSPEED TRANSMITTER ON ENGINE.

STEP 2. CONNECT THE TRANSMITTER LEADS TO ENGINE OVERSPEED SWITCH. (REFER TO WIRING DIAGRAM, FIG 1-3.)


COMPRESSOR DISCHARGE
OIL TEMP SHUTDOWN SWITCH (LOCATED IN BOTTOM OF COMPRESSOR DISCHARGE. REFER TO FIG 5-2.)
WIRING HARNESS
PLUG CONNECTOR (2)

TS5-4310-354-14/4-35 ②

D COMPRESSOR OIL TEMP SHUTDOWN SWITCH

REMOVAL

STEP 1. DISCONNECT THE TWO SWITCH PLUG CONNECTORS FROM WIRING HARNESS CONNECTORS.

STEP 2. UNSCREW AND REMOVE COMPRESSOR OIL TEMPERATURE SHUTDOWN SWITCH FROM COMPRESSOR DISCHARGE.

INSTALLATION

STEP 1. INSTALL COMPRESSOR OIL TEMPERATURE SHUTDOWN SWITCH IN COMPRESSOR DISCHARGE.

STEP 2. CONNECT THE SWITCH PLUG CONNECTORS TO WIRING HARNESS CONNECTORS. (REFER TO WIRING DIAGRAM, FIG 1-3.)

Figure 4-35. Safety switches, removal and installation (sheet 2 of 2).

4-71. Fuel Injection Pump Solenoid.

a. Removal. Notify Direct Support Maintenance if removal of fuel injection pump solenoid is necessary.

b. Cleaning and Inspection.

(1) Wipe the fuel injection pump solenoid with a clean, dry cloth.

(2) Inspect the solenoid lead terminals and wire connections for evidence of shorts and for tightness of terminal connections.

(3) Make certain solenoid is wired properly (refer to figure 1-3).

4-72. Instrument Panel Vibration Mounts.

a. Removal. Remove the instrument panel vibration mounts as shown in figure 4-36.

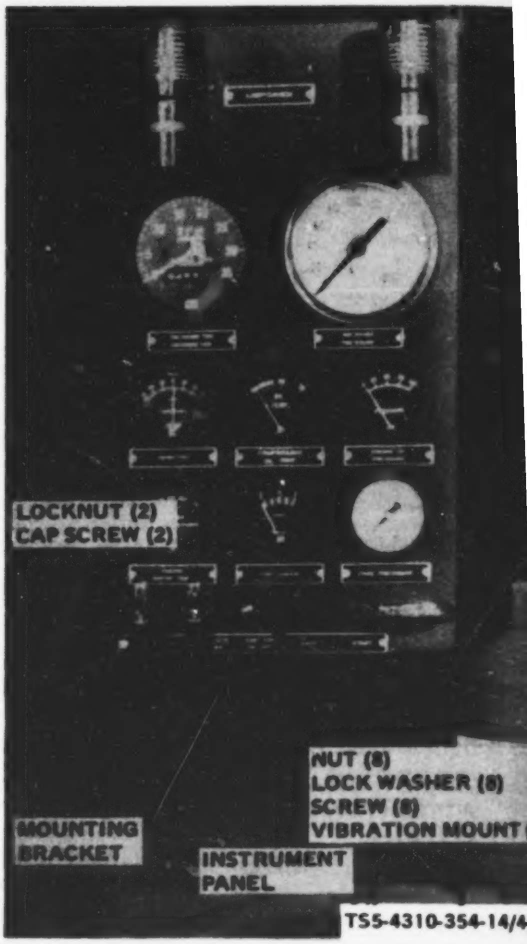
b. Cleaning and Inspection.

(1) Wipe the vibration mounts with a clean, dry cloth.

(2) Inspect the mounts for deterioration, cuts, and breaks.

(3) Inspect attaching hardware for damaged threads or any other defect.

c. Installation. Install the instrument panel vibration mounts as shown in figure 4-36.



TS5-4310-354-14/4

REMOVAL

STEP 1. REMOVE LOCKNUT AND CAP SCREW TH
ATTACH VIBRATION MOUNT TO INST
MENT PANEL MOUNTING BRACKET.

STEP 2. REMOVE NUTS, LOCK WASHERS, A
SCREWS THAT ATTACH VIBRATION MOU
TO INSTRUMENT PANEL.

INSTALLATION

STEP 1. INSTALL VIBRATION MOUNT ON INST
MENT PANEL. SECURE WITH SCREWS, LO
WASHER, AND NUTS.

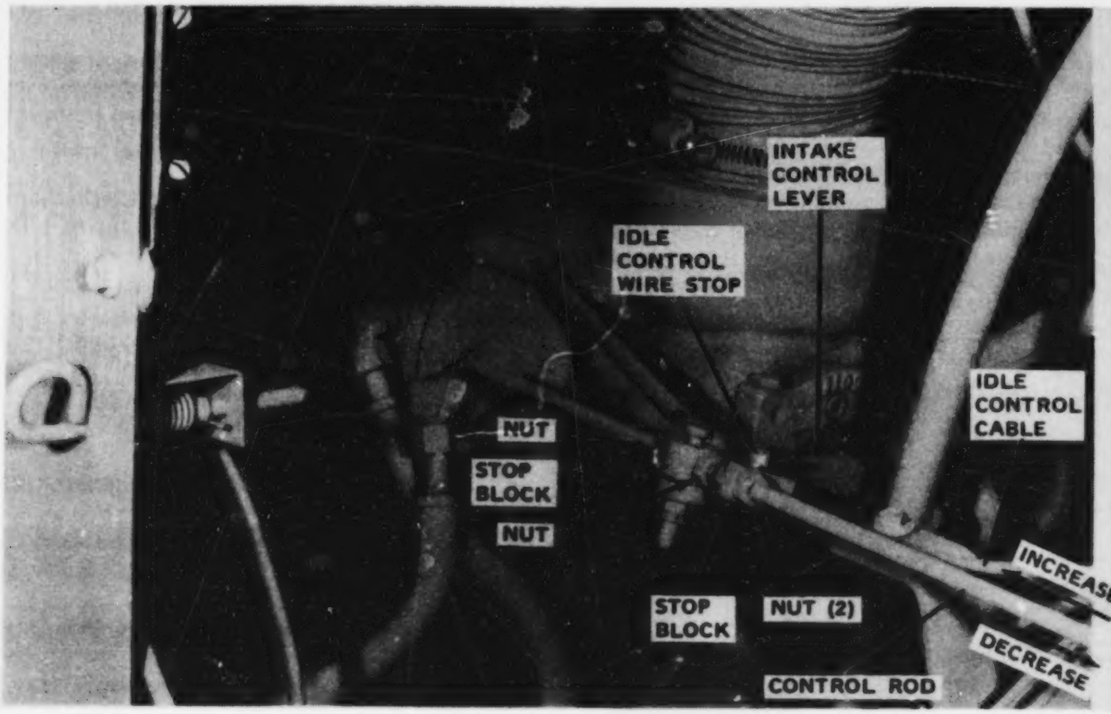
STEP 2. INSTALL CAP SCREW AND LOCK NUT
SECURE VIBRATION MOUNT TO INST
MENT PANEL MOUNTING BRACKET.

Figure 4-36. Instrument panel vibration moun removal and installation.

Section XIX. MAINTENANCE OF SPEED CONTROL LINKAGE GROUP

4-73. General. The speed control linkage group consists of the speed control rod, idle control cable, compressor intake control lever, stop block, lever return spring, and the necessary attaching hardware for these components. The speed control rod is attached to the engine fuel injection pump throttle lever. This connection regulates the engine speed in direct relation to air demand and output of the compressor. When the linkage is properly set, the compressor load and unload cycles, and the engine speed changes to suit the cycle, is automatic.

4-74. Speed Control Linkage Adjustment. Adjust the speed control linkage as shown in figure 4-37.



TS5-4310-354-14/4-37

NOTE

THE FULL OPERATING SPEED OF 2200 RPM IS SET AND CONTROLLED BY THE FUEL INJECTION PUMP GOVERNOR GROUP. REFER ANY GOVERNOR OR FUEL INJECTION PUMP MAINTENANCE TO DIRECT SUPPORT MAINTENANCE PERSONNEL.

STEP 1. START THE UNIT AND ALLOW TO RUN UNTIL COMPRESSOR UNLOADS. WHEN COMPRESSOR UNLOADS, ENGINE SPEED WILL REDUCE TO IDLE. CHECK THIS SPEED ON TACHOMETER. IDLE SPEED SHOULD BE 1000 RPM ± 50 RPM.

STEP 2. TO ADJUST IDLE SPEED, LOOSEN NUTS ON EACH SIDE OF INTAKE CONTROL LEVER STOP BLOCK. TURN WHICHEVER NUT NECESSARY TO INCREASE OR DECREASE IDLE SPEED TO 1000 RPM ± 50 RPM. (CONTROL ROD PULLING AWAY FROM ENGINE INCREASES SPEED, MOVING TOWARD ENGINE DECREASES SPEED TO POINT WHERE LOW IDLE ADJUSTING SCREW ON FUEL INJECTION PUMP RESTS ON PUMP STOP.)

STEP 3. WHEN IDLE SPEED IS SET, TIGHTEN NUTS AGAINST BOTH SIDES OF INTAKE CONTROL LEVER STOP BLOCK TO LOCK THE STOP BLOCK IN POSITION ON CONTROL ROD.

STEP 4. UNLOCK IDLE CONTROL CABLE HANDLE ON INSTRUMENT PANEL AND PULL OUTWARD TO IDLE POSITION. LOCK HANDLE. MOVE IDLE CONTROL CABLE ACTUATING WIRE STOP, AS NECESSARY, TO REST AGAINST ACTUATING WIRE STOP BLOCK. (THE ACTUATING WIRE STOP BLOCK MAY BE MOVED ON CONTROL ROD AS NECESSARY TO MAKE THIS WIRE STOP SETTING.) TIGHTEN WIRE STOP ON ACTUATING WIRE. UNLOCK IDLE CONTROL CABLE HANDLE AND PUSH IN TOWARD INSTRUMENT PANEL AND LOCK.

STEP 5. OPEN AIR SERVICE VALVE TO EXPEL AIR FROM SEPARATOR ASSEMBLY CAUSING COMPRESSOR TO LOAD. ENGINE SPEED WILL INCREASE TO FULL SPEED. WHILE OPERATING AT FULL SPEED, CHECK POSITION OF IDLE CONTROL CABLE WIRE STOP. THERE SHOULD BE CLEARANCE BETWEEN WIRE STOP AND STOP BLOCK SO THAT ENGINE FULL SPEED CAN BE ATTAINED.

STEP 6. CYCLE THE COMPRESSOR SEVERAL TIMES BY CLOSING AND OPENING AIR SERVICE VALVE. OBSERVE TACHOMETER EACH TIME COMPRESSOR UNLOADS TO ENSURE IDLE SPEED REMAINS AT 1000 RPM ± 50 RPM.

STEP 7. CLOSE AIR SERVICE VALVE AND FOLLOW NORMAL STOPPING PROCEDURE (FIG 2-7).

Figure 4-37. Speed control linkage adjustment.

CHAPTER 5

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS, AND EQUIPMENT

5-1. **Tools and Equipment.** Tools and equipment usually listed in the Basic Issue Items List and Items Troop Installed or Authorized List do not apply to this equipment.

5-2. **Special Tools and Equipment.** Special tools and equipment required for Direct Support and General Support Maintenance are listed in Repair Parts and Special Tools List manual, TM 5-4310-354-24P.

5-3. **Maintenance Repair Parts.** Repair parts and equipment are listed and illustrated in the Repair Parts and Special Tools List manual, TM 5-4310-354-24P.

Section II. TROUBLESHOOTING

5-4. **General.** This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air compressor unit within the scope of Direct Support and General Support Maintenance. The malfunctions that may occur are listed in table 5-1. For troubleshooting within the scope of Operator/Crew, refer to table 3-2 and within the scope of Organizational Maintenance refer to table 4-2. Maintenance functions within the scope of each maintenance level are indicated in the Maintenance Allocation Chart, Appendix C.

5-5. **Troubleshooting.**

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the air compressor unit. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you to determine probable causes and corrective actions to take. You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

NOTE

Before you use this table, be sure you have performed all applicable operating checks.

Table 5-1. Direct Support and General Support Troubleshooting

---

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE

1. **ENGINE FAILS TO CRANK WHEN START BUTTON IS PRESSED.**

Step 1. Starting motor defective.

Repair or replace starting motor (para 7-4).

Step 2. Fuel shutoff not functiong.

Inspect and repair or replace fuel injection pump (para 7-8).

Step 3. Defective fuel transfer pump.

Replace fuel transfer pump (para 4-43).

Step 4. Fuel pump incorrectly timed.

Check and correct timing (para 7-8).

Step 5. Valves sticking or adjusted incorrectly.

Adjust valves (para 4-50), check for sticking valves and repair or replace as necessary (para 7-13).

Step 6. Low cylinder compression.

Inspect piston rings and pistons. Repair or replace as necessary (para 7-24).

Step 7. Excessive thrust pressure on camshaft or crankshaft.

Check end play of camshaft (para 7-22).
Check end play of crankshaft (para 7-26).

Step 8. Check for coolant in cylinders.

Replace cylinder head gasket (para 7-13). If cylinder head gasket is not defective, inspect, repair, or replace cylinder block (para 7-28).

Step 9. Inspect for seized compressor.

Repair or replace air compressor (para 6-11 and 6-12).

2. **ENGINE CRANKS BUT IS HARD TO START OR FAILS TO START.**

Step 1. Check valve adjustment and for valves sticking.

Adjust valves (para 4-50), repair or replace sticking valves (para 7-13).

Table 5-1. Direct Support and General Support Troubleshooting — Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

2. **ENGINE CRANKS BUT IS HARD TO START OR FAILS TO START — continued.**

Step 2. Inspect for sticking or fouled fuel injection nozzles.

Repair or replace defective nozzles (para 7-6).

Step 3. Check fuel injection pump timing.

Time the fuel injection pump. Repair or replace if defective (para 7-8).

Step 4. Inspect for broken or worn piston rings and pistons.

Replace defective piston rings, pistons, or connecting rods (para 7-24).

Step 5. Check engine timing.

Retime the engine (para 7-20).

3. **ENGINE MISSES OR RUNS ERRATICALLY.**

Step 1. Check timing of fuel injection pump.

Retime the fuel pump (para 7-8). If injection pump is defective, repair or replace.

Step 2. Check speed control linkage.

Tighten all control linkage connections and adjust, as necessary (para 4-74).

Step 3. Check valve adjustment and for sticking valves and defective rocker arm components.

Adjust valves (para 4-50), repair or replace sticking valves and defective parts (para 7-12 and 7-13).

Step 4. Check for low compression.

Replace worn piston rings and scored pistons (para 7-24).

Step 5. Inspect for failure of main bearings, connecting rod bearings, or camshaft bearings.

Repair or replace, as necessary (para 7-26, 7-24, and 7-22).

4. **ENGINE LACKS POWER.**

Step 1. Check valve clearance.

Adjust valves (para 4-50).

Table 5-1. Direct Support and General Support Troubleshooting — Continued

---

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

4. ENGINE LACKS POWER — continued.

Step 2. Check fuel injection pump timing.

Time the injection pump (para 7-8).

Step 3. Check for low compression.

Replace defective piston rings, pistons, or connecting rods (para 7-24).

Step 4. Check for failure of main bearings, connecting rod bearings, or camshaft bearings.

Repair or replace, as necessary (para 7-26, 7-24, and 7-22).

5. ENGINE KNOCKS, DEVELOPS EXCESSIVE NOISE, OR VIBRATES.

Step 1. Check valve clearance.

Adjust valve clearance (para 4-50).

Step 2. Check fuel injection pump timing.

Time the injection pump (para 7-8).

Step 3. Check for bent or broken pushrods.

Replace defective pushrods (para 7-12).

Step 4. Inspect for clogged oil pump inlet screen and a defective pressure regulator.

Clean the oil pump inlet screen. Replace a defective pressure regulator (para 7-15 an 7-16).

Step 5. Inspect for worn piston rings, scored pistons, loose piston pin, and worn connecting rod bearings

Replace defective parts (para 7-24).

Step 6. Check for failure of main bearing, connecting rod bearings, and camshaft bearings.

Repair or replace, as necessary (para 7-26, 7-24, and 7-22).

6. ENGINE HAS LOW OIL PRESSURE.

Step 1. Check oil pump inlet screen for clogging and for defective pressure regulator.

Clean a clogged inlet screen and replace a defective regulator (para 7-15 and 7-16).

Table 5-1. Direct Support and General Support Troubleshooting — Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

6. ENGINE HAS LOW OIL PRESSURE — continued.

Step 2. Inspect for defective oil pump.

Repair or replace oil pump (para 7-16).

Step 3. Check if rocker arm shaft is installed correctly.

Install rocker arm shaft in accordance with para 7-12 and figure 7-37.

Step 4. Inspect for failure of main bearings, connecting rod bearings, and camshaft bearings.

Repair or replace, as necessary (para 7-26, 7-24, and 7-22).

Step 5. Check of oil header plugs are missing or loose.

Install oil header plugs or tighten, as necessary (para 7-28).

7. ENGINE OVERHEATING.

Step 1. Inspect thermostat for proper operation.

Replace a defective thermostat (figure 7-35).

Step 2. Check water pump for defective parts.

Repair or replace the water pump (para 7-10).

Step 3. Inspect for cracked cylinder block.

Replace a defective cylinder block (para 7-28).

8. ENGINE HAS LOW FUEL PRESSURE.

Step 1. Check timing of fuel injection pump.

Time the injection pump (para 7-8).

Step 2. Check for defective fuel injection pump.

Repair or replace injection pump (para 7-8).

9. ENGINE EXHAUST EXCESSIVELY BLACK.

Step 1. Check timing of fuel injection pump.

Time the injection pump (para 7-8).

Table 5-1. Direct Support and General Support Troubleshooting — Continued

---

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

9. ENGINE EXHAUST EXCESSIVELY BLACK — continued

Step 2. Check for sticking valves and improper valve clearance.

Adjust valve clearance (para 4-50). Repair or replace damaged valves (para 7-13).

Step 3. Inspect the fuel injection nozzles.

Repair or replace injection nozzles (para 7-6).

Step 4. Inspect thermostat for proper operation.

Replace defective thermostat (para 7-13).

10. ENGINE EXHAUST EXCESSIVELY BLUE.

Step 1. Check valve clearance and check for sticking valves.

Adjust valve clearance (para 4-50).

Repair or replace damaged valves (para 7-13).

Step 2. Check for correct installation of rocker arm shaft.

Install rocker arm shaft in accordance with para 7-12 and figure 7-37.

Step 3. Inspect for damaged or worn piston rings, pistons, and connecting rods.

Repair or replace all defective parts (para 7-24).

Step 4. Inspect for failure of main bearings, connecting rod bearing, and camshaft bearings.

Repair or replace, as necessary (para 7-26, 7-24, and 7-22).

11. EXCESSIVE OIL CONSUMPTION.

Step 1. Check oil pan gaskets and seals for leakage.

Replace damaged gaskets and seals (para 7-15).

Step 2. Inspect for damaged or worn piston rings, pistons, and connecting rods.

Repair or replace all defective parts (para 7-24).

Step 3. Check for loose or missing oil header plugs.

Tighten or install plugs, as necessary (para 7-28).

Table 5-1. Direct Support and General Support Troubleshooting — Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE — continued

12. EXCESSIVE FUEL CONSUMPTION.

Step 1. Check timing of fuel injection pump and for a defective or leaking pump.

Time the injection pump. Repair or replace a defective pump (para 7-8).

13. ENGINE STALLS AT LOW SPEED.

Step 1. Check timing of fuel injection pump and for a defective pump.

Time the injection pump. Repair or replace if defective (para 7-8).

Step 2. Inspect fuel injection nozzles for clogging and proper installation.

Repair or replace defective nozzles (para 7-6).

14. ENGINE FAILS TO STOP.

Step 1. Check fuel injection pump for a defective solenoid or governor.

Repair or replace fuel injection pump (para 7-8).

15. ENGINE STOPS SUDDENLY.

Step 1. Check for engine seizure.

Overhaul the engine and replace defective parts (Chapter 7).

Step 2. Check for seizure of compressor.

Overhaul the compressor and replace defective parts (Chapter 6).

AIR COMPRESSOR

16. AIR COMPRESSOR OVERHEATING.

Step 1. Check oil separator element for clogging.

Replace the element (para 6-4).

Step 2. Inspect for oxidized oil (varnished).

Disassemble the oil separator assembly (para 6-2), oil filter-thermal bypass assembly (para 6-9), air compressor assembly (6-11), and compressor oil cooler (para 6-14). Clean all parts as specified in these paragraphs. Replace oil separator element and reassembly.

Table 5-1. Direct Support and General Support Troubleshooting — Continued

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

AIR COMPRESSOR — continued

17. COMPRESSOR IS NOISY.

Step 1. Inspect for broken rotor blades.

Replace broken rotor blades (para 6-12).

Step 2. Inspect for defective rotor bearing.

Disassemble air compressor and replace defective bearing (para 6-11).

18. COMPRESSOR NOT OPERATING AT FULL CAPACITY OR PRESSURE.

Step 1. Inspect for damaged intake control.

Repair or replace any defective parts of the intake control (para 6-11).

Step 2. Check for sticking rotor blades.

Inspect blades and replace, as necessary (para 6-12).

Step 3. Check fuel injection pump for proper operation of governor and control mechanism.

Repair or replace fuel injection pump, as necessary (para 7-8).

19. EXCESSIVE OIL CONSUMPTION.

Step 1. Inspect for damaged oil separator element.

Replace damaged element (para 6-4).

Step 2. Inspect for damaged seals in air compressor.

Disassemble compressor and replace damaged parts (para 6-11).

20. COMPRESSOR UNLOADS BUT ENGINE DOES NOT RETURN TO IDLE.

Step 1. Check for defective intake control mechanism.

Disassemble and repair or replace all defective parts (para 6-11).

Step 2. Inspect fuel injection pump speed control lever and the pump for proper timing and operation

Repair or replace fuel injection pump, as necessary (para 7-8).

21. RECEIVER PRESSURE GAUGE ERRATIC.

Step 1. Inspect air pressure regulator and blowdown valve for proper operation.

Repair or replace air pressure regulator assembly (para 6-7). Replace a defecti blowdown valve (para 6-6).

Table 5-1. Direct Support and General Support Troubleshooting — Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

AIR COMPRESSOR — continued

22. TACHOMETER-HOURMETER ERRATIC.

Step 1. Inspect tachometer-hourmeter adapter on the engine for defective parts.

Replace damaged drive adapter parts (figure 7-42).

23. COMPRESSOR FAILS TO LOAD OR UNLOAD.

Step 1. Check for improperly set or damaged air pressure regulator.

Repair or replace then set air pressure regulator (para 6-7).

Step 2. Inspect compressor intake control mechanism.

Replace defective parts (para 6-11).

24. COMPRESSOR VIBRATES AND METALLIC NOISE IN COMPRESSOR.

Step 1. Inspect for sticking or broken rotor blades.

Replace defective blades (para 6-12).

Step 2. Inspect for damaged rotor bearings, rotor, or stator.

Overhaul the compressor and replace all defective parts (para 6-11).

Section III. GENERAL MAINTENANCE

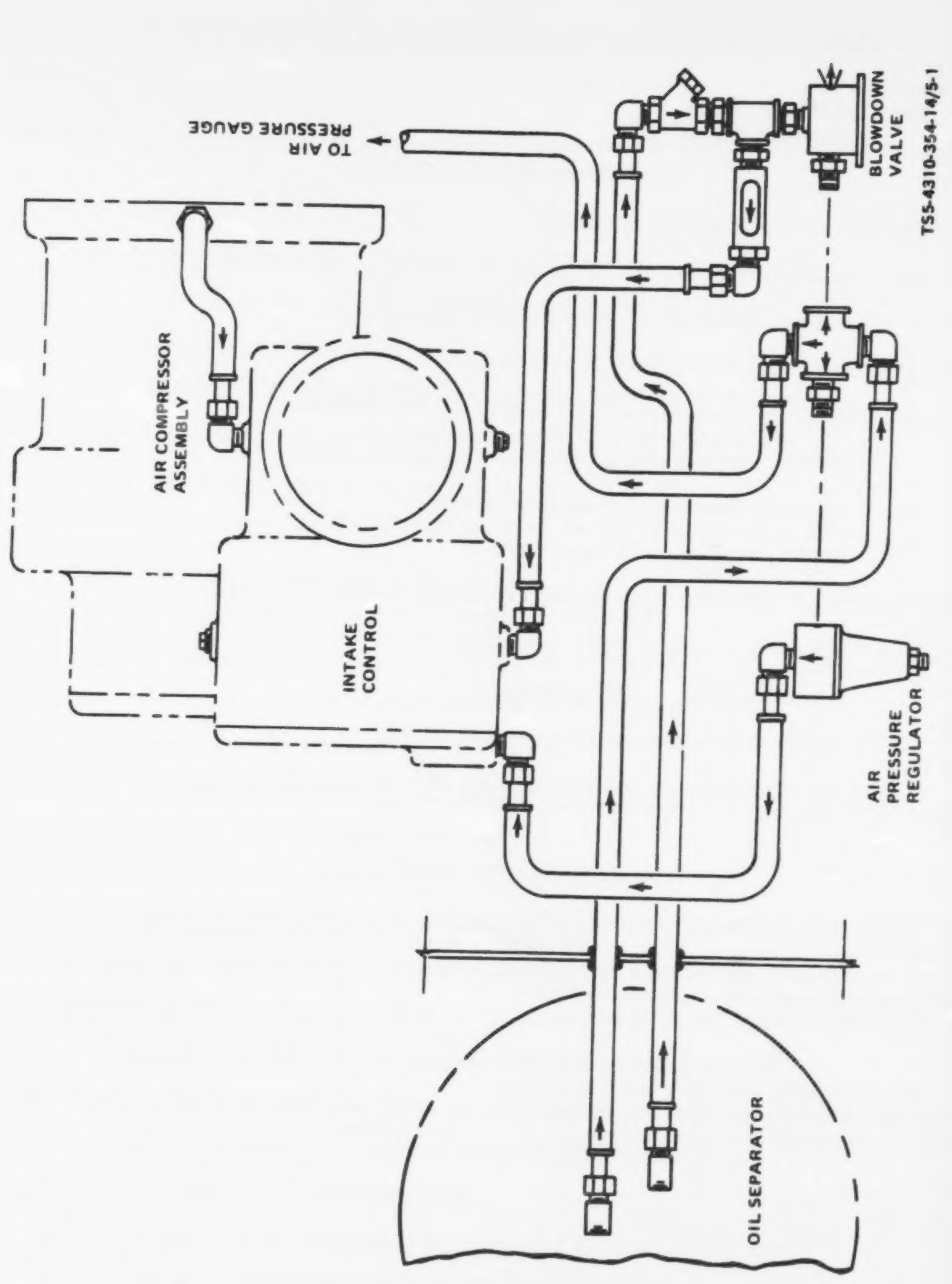
5-6. General. This section contains those repair instructions and references which are the responsibility of Direct Support and General Support Maintenance, as authorized by the maintenance allocation chart, Appendix C, and are general in nature.

5-7. Reference Data and Diagrams. Reference torque data, diagrams, and repair and replacement standards are listed or referenced below.

a. Torque Data. Table 1-1 lists general and specific torque values recommended by the compressor unit manufacturer and the engine manufacturer.

b. Wiring Diagram. Refer to figure 1-3 for schematic wiring diagram of the air compressor unit electrical system.

c. Air Line Diagram. Refer to figure 5-1 for the unit schematic air line diagram.


TO AIR PRESSURE GAUGE
AIR COMPRESSOR ASSEMBLY
INTAKE CONTROL
BLOWDOWN VALVE
AIR PRESSURE REGULATOR
OIL SEPARATOR
TS5-4310-354-14/5-1

d. Compressor Oil Cycle Diagram. Refer to figure 5-2 for a schematic diagram of the compressor oil cycle showing the compressor oil flow through the air compressor system.

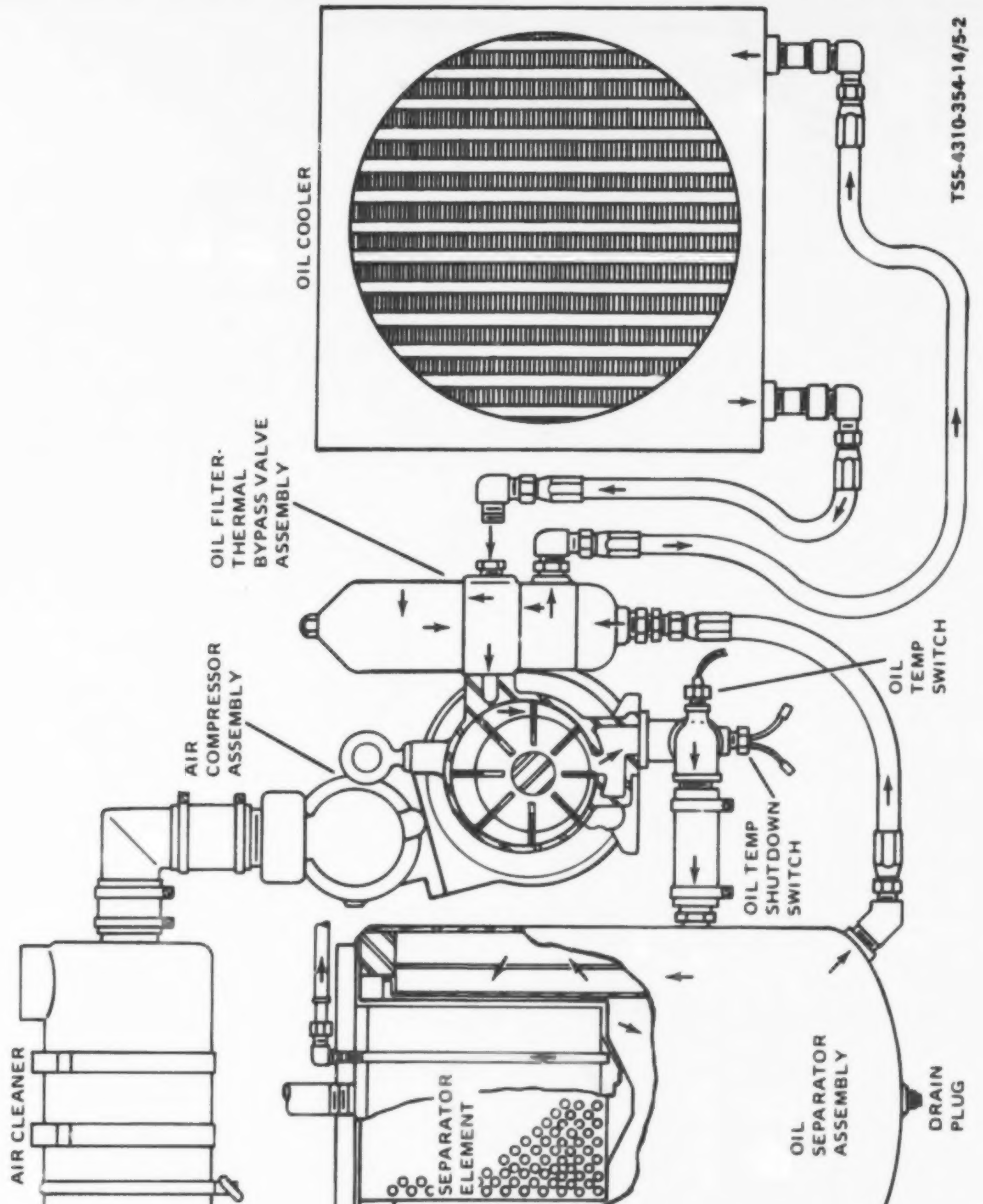

OIL COOLER
TS5-4310-354-14/5-2
OIL FILTER-THERMAL BYPASS VALVE ASSEMBLY
AIR COMPRESSOR ASSEMBLY
OIL TEMP SWITCH
OIL TEMP SHUTDOWN SWITCH
AIR CLEANER
SEPARATOR ELEMENT
OIL SEPARATOR ASSEMBLY
DRAIN PLUG
OIL FILLER PLUG

Figure 5-2. Compressor oil cycle schematic diagram

e. Fuel System Diagram. Refer to figure 5-3 for a schematic diagram of the unit fuel system.

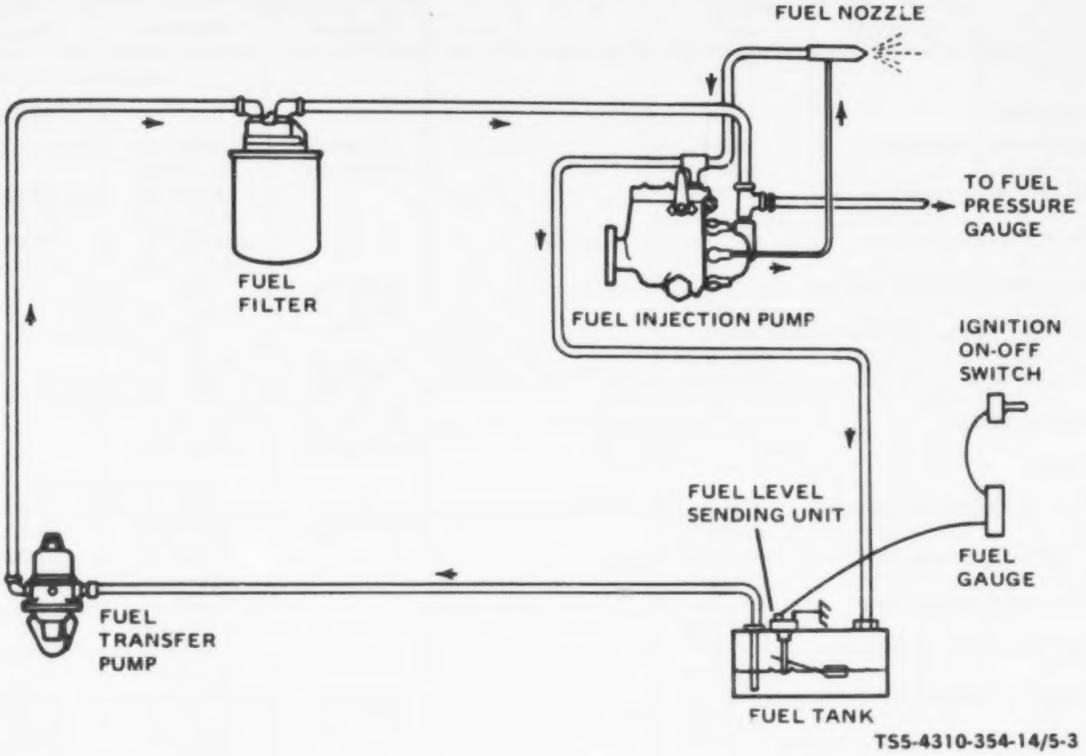

FUEL NOZZLE
TO FUEL PRESSURE GAUGE
FUEL FILTER
FUEL INJECTION PUMP
IGNITION ON-OFF SWITCH
FUEL LEVEL SENDING UNIT
FUEL GAUGE
FUEL TRANSFER PUMP
FUEL TANK
TS5-4310-354-14/5-3

Figure 5-3. Fuel system schematic diagram.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

f. General Cleaning of Parts. In general, clean all metallic parts using cleaning solvent, Federal Specification P-D-680, Type II. Clean non-metalic parts with a clean, lint-free cloth dampened with this same solvent. Dry all parts thoroughly. Any cleaning that differs from this general method will be found in instructions for that specific item.

g. Repair and Replacement Standards. Refer to table 5-2 for repair and replacement standards recommended by the manufacturer for engine and compressor components.

Table 5-2. Repair and Replacement Standards

Component	New parts		Maximum allowable wear/ clearance
	Minimum	Maximum	
ENGINE			
Cylinder Block:			
Cylinder bore diameter	3.749 in. (95.225 mm)	3.751 in. (95.275 mm)	
Cylinder bore out-of-round		0.0005 in. (0.0127 mm)	0.0030 in. (0.0762 mm)
Cylinder bore taper		0.0005 in. (0.0127 mm)	0.0020 in. (0.0508 mm)
Main bearing bore, less bearings	3.0665 in. (77.8891 mm)	3.0670 in. (77.9018 mm)	
Camshaft bearing bore, less bearings	2.187 in. (55.550 mm)	2.188 in. (55.575 mm)	
Oil pump bore	2.000 in. (50.8000 mm)	2.0005 in. (50.8127 mm)	
Valve tappet bore	0.7494 in. (19.0348 mm)	0.7500 in. (19.0500 mm)	
Crankshaft:			
Main bearing journal diameter	2.8734 in. (72.9844 mm)	2.8744 in. (73.0098 mm)	0.0030 in. (0.0762 mm)
Main bearing journal out-of-round		0.0003 in. (0.0076 mm)	0.0020 in. (0.0508 mm)
Main bearing journal taper		0.0003 in. (0.0076 mm)	0.0015 in. (0.0381 mm)
Main bearing run-out at center		0.0020 in. (0.0508 mm)	0.0030 in. (0.0762 mm)
Connecting rod journal diameter	2.373 in. (60.274 mm)	2.374 in. (60.300 mm)	0.002 in. (0.0508 mm)
Connecting rod journal out-of-round		0.0003 in. (0.0076 mm)	0.0020 in. (0.0508 mm)
Connecting rod journal taper		0.0003 in. (0.0076 mm)	0.0015 in. (0.0381 mm)
Crankshaft main bearing clearance	0.0009 in. (0.0229 mm)	0.0034 in. (0.0864 mm)	0.0070 in. (0.1778 mm)
Crankshaft thrust clearance	0.005 in. (0.127 mm)	0.010 in. (0.254 mm)	0.015 in. (0.381 mm)
Seal surface diameter, rear	4.310 in. (109.474 mm)	4.315 in. (109.601 mm)	0.015 in. (0.381 mm)
Seal surface diameter, front	1.874 in. (47.600 mm)	1.875 in. (47.625 mm)	0.015 in. (0.381 mm)
Connecting Rods:			
Length, center-to-center	7.998 in. (203.149 mm)	8.002 in. (203.251 mm)	
Bearing bore, less bearings	2.526 in. (64.160 mm)	2.527 in. (64.186 mm)	
Bearing to crankshaft clearance	0.001 in. (0.0254 mm)	0.003 in. (0.0762 mm)	0.005 in. (0.127 mm)
Side clearance	0.005 in. (0.127 mm)	0.012 in. (0.305 mm)	0.020 in. (0.508 mm)
Piston pin bushing bore, less bearing	1.437 in. (36.500 mm)	1.438 in. (36.525 mm)	
Piston pin bushing bore	1.2503 in. (31.7576 mm)	1.2508 in. (31.7703 mm)	0.0015 in. (0.0381 mm)

Table 5-2. Repair and Replacement Standards — Continued

Component	New parts		Maximum allowable wear/ clearance
	Minimum	Maximum	
ENGINE — continued			
Camshaft:			
Bearing journal diameter, all	2.053 in. (52.146 mm)	2.054 in. (52.172 mm)	0.002 in. (0.0508 mm)
Lobe diameter, base to tip	1.720 in. (43.688 mm)	1.725 in. (43.815 mm)	0.010 in. (0.254 mm)
Journal run-out (in vee blocks)		0.001 in. (0.0254 mm)	0.004 in. (0.102 mm)
Bearing clearance	0.0015 in. (0.0381 mm)	0.0035 in. (0.0889 mm)	0.0060 in. (0.1524 mm)
End thrust	0.005 in. (0.127 mm)	0.008 in. (0.203 mm)	0.012 in. (0.305 mm)
Back lash, camshaft-to-crankshaft gear	0.0015 in. (0.0381 mm)	0.0025 in. (0.0635 mm)	
Piston:			
Clearance in cylinder bore, all (With newly honed bores and new pistons. Pull on ½x0.005-in. ribbon.)	5 pounds (2.27 kilograms)	8 pounds (3.63 kilograms)	
Piston pin bore	1.2500 in. (31.7500 mm)	1.2502 in. (31.7551 mm)	0.0010 in. (0.0254 mm)
Width of ring groove, top, Keystone	⅛-in. nom (3.175 mm)		
Width of ring groove, 2nd	0.0975 in. (2.4765 mm)	0.0990 in. (2.5146 mm)	0.0050 in. (0.127 mm)
Width of ring groove, oil control	0.1880 in. (4.7752 mm)	0.1895 in. (4.8133 mm)	0.0050 in. (0.127 mm)
Piston Pin:			
Length	3.035 in. (77.089 mm)	3.040 in. (77.216 mm)	
Diameter	1.2498 in. (31.7449 mm)	1.2499 in. (31.7475 mm)	0.0020 in. (0.0508 mm)
Clearance in piston	0.0000 in. (0.0000 mm)	0.0005 in. (0.0127 mm)	0.0020 in. (0.0508 mm)
Clearance in connecting rod	0.0005 in. (0.0127 mm)	0.0012 in. (0.0305 mm)	0.0050 in. (0.1270 mm)
Piston Rings:			
Clearance in groove, top	Keystone taper		
Clearance in groove, 2nd	0.0040 in. (0.1016 mm)	0.0060 in. (0.1524 mm)	0.0080 in. (0.2032 mm)
Clearance in groove, oil control	0.0015 in. (0.0381 mm)	0.0030 in. (0.0762 mm)	0.0080 in. (0.2032 mm)
Ring gap	0.0100 in. (0.254 mm)	0.0200 in. (0.508 mm)	0.0400 in. (1.016 mm)
Intake Valves:			
Head diameter	1.6825 in. (42.7355 mm)	1.6925 in. (42.9895 mm)	
Stem diameter	0.3725 in. (9.4615 mm)	0.3735 in. (9.4869 mm)	0.0025 in. (0.0635 mm)
Stem-to-guide clearance	0.0005 in. (0.0127 mm)	0.0025 in. (0.0635 mm)	0.0050 in. (0.1270 mm)
Stem-to-rocker arm clearance, hot	0.0150 in. (0.381 mm)		
Seat diameter in head	1.647 in. (41.834 mm)	1.653 in. (41.986 mm)	
Seat width in head		5/64-in. (1.9844 mm)	⅛-in. (3.175 mm)

Table 5-2. Repair and Replacement Standards — Continued

Component	New parts		Maximum allowable wear/ clearance
	Minimum	Maximum	
ENGINE — continued			
Intake Valves — continued:			
Top of valve recessed below cylinder head deck	0.0210 in. (0.5334 mm)		
Valve seat angle	30°		
Exhaust Valves:			
Head diameter	1.495 in. (37.973 mm)	1.505 in. (38.227 mm)	
Stem diameter	0.3740 in. (9.4996 mm)	0.3750 in. (9.5250 mm)	0.0025 in. (0.0635 mm)
Stem-to-guide clearance	0.0015 in. (0.0381 mm)	0.0035 in. (0.0889 mm)	0.0060 in. (0.1524 mm)
Stem-to-rocker arm clearance, hot	0.0150 in. (0.381 mm)		
Seat diameter in head	1.451 in. (36.855 mm)	1.456 in. (36.982 mm)	
Seat width in head		5/64 in. (1.9844 mm)	1/8 in. (3.175 mm)
Top of valve recessed below cylinder head deck	0.0210 in. (0.5334 mm)		
Valve seat angle	45°		
Valve Guide:			
Length	2.7244 in. (69.1998 mm)	2.7444 in. (69.7078 mm)	
Outside diameter	0.6265 in. (15.9131 mm)	0.6270 in. (15.9258 mm)	
Bore diameter intake valve guide, rear	0.3740 in. (9.4996 mm)	0.3750 in. (9.5250 mm)	0.0030 in. (0.0762 mm)
Bore diameter exhaust valve guide, ream	0.3750 in. (9.5250 mm)	0.3760 in. (9.5504 mm)	0.0030 in. (0.0762 mm)
Depth below cylinder head deck, all	1.370 in. (34.798 mm)	1.380 in. (35.052 mm)	
Tappet, Valve Lifter (push rod):			
Body diameter	0.7485 in. (19.0119 mm)	0.7490 in. (19.0246 mm)	0.0030 in. (0.0762 mm)
Overall length	2.245 in. (57.023 mm)	2.255 in. (57.277 mm)	
Clearance in bore (block)	0.0005 in. (0.0127 mm)	0.0015 in. (0.0381 mm)	0.0050 in. (0.127 mm)
Valve Springs, Intake and Exhaust:			
Free length	1.796 in. (45.6184 mm)	1.836 in. (46.6344 mm)	
Total coils	6¼		
Wire diameter	0.177 in. (4.4958 mm)		
Outside diameter	1.292 in. (32.8168 mm)	1.302 in. (33.0708 mm)	
Test load at 1.492 in. (37.8968 mm)	72 pounds (32.66 kilograms)	82 pounds (37.20 kilograms)	
Test load at 1.082 in. (27.4828 mm)	163 pounds (73.94 kilograms)	180 pounds (81.65 kilograms)	

Table 5-2. Repair and Replacement Standards — Continued

Component	New parts		Maximum allowable wear/ clearance
	Minimum	Maximum	
ENGINE — continued			
Oil Pump Body:			
Shaft bore diameter, main and idler	0.6255 in. (15.8877 mm)	0.6265 in. (15.9131 mm)	0.0030 in. (0.0762 mm)
Pump gear bore diameter	1.5005 in. (38.1127 mm)	1.5015 in. (38.1381 mm)	0.0050 in. (0.127 mm)
Pump gear bore depth	1.5640 in. (39.7256 mm)	1.5650 in. (39.7510 mm)	0.0040 in. (0.1016 mm)
Oil Pump Shafts:			
Length, main	9.240 in. (234.696 mm)	9.250 in. (234.950 mm)	
Length, idler	2.745 in. (69.723 mm)	2.755 in. (69.977 mm)	
Diameter, main and idler	0.6240 in. (15.8496 mm)	0.6245 in. (15.8623 mm)	0.0020 in. (0.0508 mm)
Shaft clearance in body	0.0010 in. (0.0254 mm)	0.0025 in. (0.0635 mm)	0.0060 in. (0.1524 mm)
Oil Pump Gears:			
Outside diameter, both	1.4975 in. (38.0365 mm)	1.4985 in. (38.0619 mm)	0.0020 in. (0.0508 mm)
Length, both	1.5610 in. (39.6494 mm)	1.5620 in. (39.6748 mm)	
Clearance in body bore	0.0020 in. (0.0508 mm)	0.0040 in. (0.1016 mm)	0.0070 in. (0.1778 mm)
End clearance to body	0.0020 in. (0.0508 mm)	0.0040 in. (0.1016 mm)	0.0080 in. (0.2032 mm)
Backlash, drive gear to camshaft	0.0060 in. (0.1524 mm)	0.0120 in. (0.3048 mm)	0.0200 in. (0.508 mm)
Flywheel:			
Face run-out at 6 inch radius		0.0080 in. (0.2032 mm)	
Pilot bore eccentricity		0.0050 in. (0.127 mm)	
Flywheel Housing:			
Compressor adapter bore eccentricity		0.0050 in. (0.127 mm)	
Rocker Arm Mechanism:			
Rocker shaft length	19.490 in. (495.046 mm)	19.510 in. (495.554 mm)	
Rocker shaft diameter	0.859 in. (21.8186 mm)	0.860 in. (21.8440 mm)	0.003 in. (0.0762 mm)
Rocker arm bore diameter	0.8625 in. (21.9075 mm)	0.8635 in. (21.9329 mm)	0.003 in. (0.0762 mm)
Rocker arm clearance on shaft	0.0025 in. (0.0635 mm)	0.0045 in. (0.1143 mm)	0.012 in. (0.3048 mm)
Fuel Injection Pump:			
Gear train backlash: Crankshaft to large idler	0.0015 in. (0.0381 mm)	0.0025 in. (0.0635 mm)	
Small idler to fuel pump	0.0015 in. (0.0381 mm)	0.0025 in. (0.0635 mm)	
Total, fuel pump to crankshaft	0.003 in. (0.0762 mm)	0.005 in. (0.127 mm)	

Table 5-2. Repair and Replacement Standards — Continued

Component	New parts		Maximum allowable wear/ clearance
	Minimum	Maximum	
COMPRESSOR			
Drive End Cover:			
Bearing bore diameter	3.1496 in. (79.999 mm)	3.1508 in. (80.030 mm)	
Bearing bore depth	1.870 in. (47.498 mm)	1.875 in. (47.625 mm)	
Stator register diameter	8.5005 in. (215.913 mm)	8.5025 in. (215.964 mm)	
Adapter register diameter	9.240 in. (234.696 mm)	9.250 in. (234.950 mm)	
Concentricity — Bearing bore to stator and adapter registers (total indicator reading)	0.000 in. (0.0000 mm)	0.001 in. (0.0254 mm)	
Non-Drive End Cover:			
Bearing bore diameter	3.1496 in. (79.999 mm)	3.1508 in. (80.030 mm)	
Bearing bore depth	1.870 in. (47.498 mm)	1.875 in. (47.625 mm)	
Stator register diameter	8.5005 in. (215.913 mm)	8.5025 in. (215.964 mm)	
Concentricity — Bearing bore to stator register (total indicator reading)	0.000 in. (0.0000 mm)	0.001 in. (0.0254 mm)	
Bearing Retaining Cover:			
Register outside diameter	3.140 in. (79.756 mm)	3.145 in. (79.883 mm)	
Flange to face	0.490 in. (12.446 mm)	0.495 in. (12.573 mm)	
Oil Seal Cover:			
Register outside diameter	3.140 in. (79.756 mm)	3.145 in. (79.883 mm)	
Flange to face	0.510 in. (12.954 mm)	0.515 in. (13.081 mm)	
Oil seal bore	2.2485 in. (57.1119 mm)	2.2515 in. (57.1881 mm)	
Sealing sleeve bore	2.905 in. (73.787 mm)	2.910 in. (73.914 mm)	
Stator:			
Length (overall)	9.129 in. (231.877 mm)	9.131 in. (231.927 mm)	
Inside diameter (through bore)	5.784 in. (146.914 mm)	5.787 in. (146.990 mm)	
End cover mounting diameter (each end)	8.4985 in. (215.8619 mm)	8.5005 in. (215.9127 mm)	
Concentricity — non-drive end cover mounting dia to drive end cover mounting dia (total indicator reading)	0.000 in. (0.0000 mm)	0.003 in. (0.0762 mm)	
End faces parallel (total indicator reading)	0.000 in. (0.0000 mm)	0.001 in. (0.0254 mm)	

Table 5-2. Repair and Replacement Standards — Continued

Component	New parts		Maximum allowable wear/ clearance
	Minimum	Maximum	
COMPRESSOR — continued			
Rotor:			
Length	9.123 in. (231.724 mm)	9.125 in. (231.775 mm)	
Outside diameter	4.998 in. (126.949 mm)	5.000 in. (127.000 mm)	
Bore	1.610 in. (40.894 mm)	1.611 in. (40.919 mm)	
Blade slot width	0.1865 in. (4.7371 mm)	0.1885 in. (4.7879 mm)	
Concentricity — outside diameter to bore (total indicator reading, maximum material condition)	0.000 in. (0.0000 mm)	0.004 in. (0.1016 mm)	
Rotor ends square with bore (total indicator reading, maximum material conditon)	0.000 in. (0.0000 mm)	0.002 in. (0.0508 mm)	
Shaft:			
Bearing journals	1.3782 in. (35.0063 mm)	1.3786 in. (35.0164 mm)	
Rotor journal	1.608 in. (40.843 mm)	1.609 in. (40.869 mm)	
Seal and coupling journal	1.249 in. (31.725 mm)	1.250 in. (31.750 mm)	0.002 in. (0.051 mm)
Concentricity of all journals (total indicator reading)	0.000 in. (0.0000 mm)	0.001 in. (0.0254 mm)	
Blades:			
Length	9.110 in. (231.394 mm)	9.112 in. (231.445 mm)	
Width	1.248 in. (31.699 mm)	1.250 in. (31.750 mm)	1/16 in. (1.588 mm)
Thickness	0.1841 in. (4.676 mm)	0.1871 in. (4.752 mm)	
Ends square with length	0.000 in. (0.0000 mm)	0.001 in. (0.0254 mm)	

Section IV. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS AND ASSEMBLIES

5-8. General. The major components covered in this section are the compressor oil separator assembly, blowdown valve assembly, air compressor assembly, and the engine assembly.

5-9. Compressor Oil Separator Assembly.

a. *Removal.*

(1) Drain all oil from oil separator tank (figure 3-3).

(2) Remove the hose reel assembly (para 4-25.*a*.).

(3) Remove air hoses from fittings on top of separator (figure 4-22).

(4) Attach a suitable lifting device to the compressor oil separator assembly and remove from the unit as shown in figure 5-4.

REMOVAL

STEP 1. DISCONNECT OIL HOSE ASSEMBLY FROM SEPARATOR OUTLET ELBOW.

STEP 2. LOOSEN HOSE CLAMPS, DISCONNECT AND REMOVE SEPARATOR INLET HOSE.

STEP 3. REMOVE LOCKNUTS AND U-BOLT.

STEP 4. REMOVE NUTS, LOCK WASHERS, CAP SCREWS, AND FLAT WASHERS THAT SECURE SEPARATOR TANK TO BRACKET. REMOVE THE OIL SEPARATOR ASSEMBLY.

INSTALLATION

STEP 1. INSTALL OIL SEPARATOR ASSEMBLY IN POSITION AND SECURE SEPARATOR TANK TO MOUNTING BRACKET WITH FLAT WASHERS, CAP SCREWS, LOCK WASHERS, AND NUTS.

STEP 2. INSTALL U-BOLT AND SECURE WITH LOCK NUTS.

STEP 3. INSTALL SEPARATOR INLET HOSE AND TIGHTEN HOSE CLAMPS.

STEP 4. CONNECT OIL HOSE ASSEMBLY TO SEPARATOR OUTLET ELBOW.

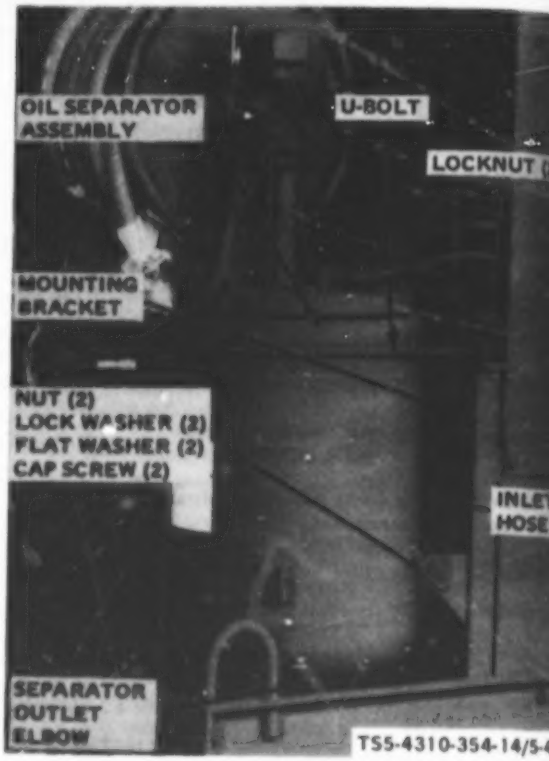

OIL SEPARATOR ASSEMBLY
U-BOLT
LOCKNUT
MOUNTING BRACKET
NUT (2)
LOCK WASHER (2)
FLAT WASHER (2)
CAP SCREW (2)
INLE
HOSE
SEPARATOR OUTLET ELBOW
TS5-4310-354-14/5-

Figure 5-4. Compressor oil separator assembly, removal and installation.

b. *Installation.*

(1) Attach a suitable lifting device to the compressor oil separator assembly and install on the unit as shown in figure 5-4.

(2) Connect the air hoses to fittings on top of separator (figure 4-22).

(3) Install the hose reel assembly (para 4-25*f*.).

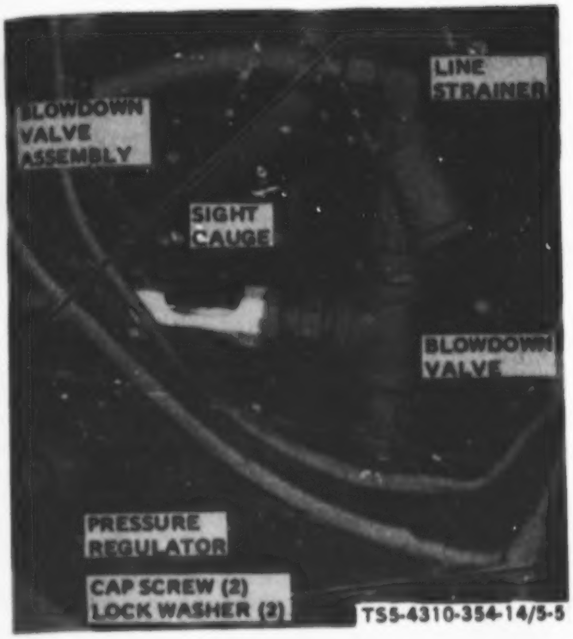
(4) Fill the oil separator tank with proper grade of lubricating oil in accordance with L 5-4310-354-12, figure 3-1.

5-10. Blowdown Valve Assembly.

a. *Removal.*

(1) Disconnect air hose assemblies from blowdown valve assembly fittings (figure 4-22).

(2) Remove the blowdown valve assembly a shown in figure 5-5.



REMOVAL

STEP 1. REMOVE CAP SCREWS AND LOCK WASHERS THAT SECURE BLOWDOWN VALVE ASSEMBLY TO COMPRESSOR.

STEP 2. REMOVE THE BLOWDOWN VALVE ASSEMBLY FROM UNIT.

INSTALLATION

STEP 1. INSTALL BLOWDOWN VALVE ASSEMBLY IN POSITION ON UNIT.

STEP 2. INSTALL LOCK WASHERS AND CAP SCREWS SECURING BLOWDOWN VALVE ASSEMBLY TO COMPRESSOR.

Figure 5-5. Blowdown valve assembly, removal and installation.

b. Installation.

(1) Install the blowdown valve assembly as shown in figure 5-5.

(2) Connect air hose assemblies to blowdown valve assembly fittings (figure 4-22 and figure 5-1).

c. Testing. Testing of the blowdown valve assembly (figure 5-5) is to be done after installation in order to produce actual operating conditions. The function of this assembly is in direct relation to pressure in oil separator tank and within the compressor air intake. After the assembly is installed, and air pressure regulator is adjusted (para 6-7.*d*), test the blowdown valve assembly as follows:

(1) With unit operating and service valves closed, test all hose connections for air leaks by applying a soapy water solution with a brush. Leakage will be indicated by bubbling of the solution. Tighten all connections.

(2) Allow the unit to run at least until full pressure is attained in separator tank and compressor automatically unloads. Again check blowdown valve for leakage.

(3) While unit is operating, either in load or unload mode, observe the sight gauge (figure 5-5). There should be a flow of air-oil mixture seen.

(4) Cycle the air compressor several times by opening and closing the air service valve on the oil separator. Then, stop the unit (figure 2-7) observing air pressure gauge on instrument panel and blowdown valve (figure 5-5). Air in the system should be relieved through the blowdown valve and the pressure gauge should indicate no pressure within 30 to 45 seconds.

5-11. Air Compressor Assembly.

a. Removal.

(1) Remove the engine exhaust muffler (figure 4-9).

(2) Remove the exterior components on compressor enclosure as necessary to gain access to the air compressor (figure 4-12).

(3) Remove the engine and compressor air cleaner assemblies (figure 4-15).

(4) Disassemble compressor enclosure to the extent necessary to gain access to the compressor (figure 4-17).

(5) Disconnect and remove compressor air intake lines, hoses, and fittings (figures 4-21 and 4-22).

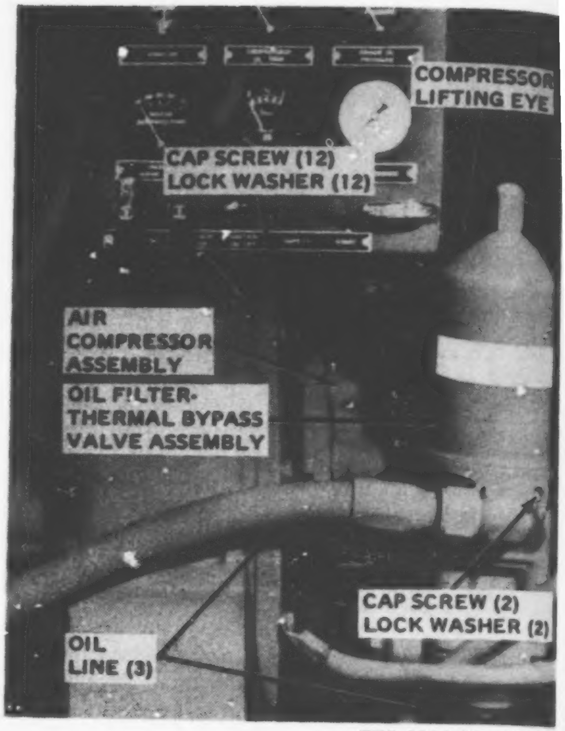
(6) Remove the blowdown valve assembly (para 5-10*a*. and figure 5-5).

(7) Remove compressor oil temperature shutdown switch and oil temperature sensing bulb. Disconnect and remove oil separator inlet hose (para 4-56, 4-70 and figure 5-4).

(8) Disconnect compressor unloader control cable and idle control cable (para 4-63).

(9) Disconnect speed control rod return spring. Disconnect speed control rod stop block from compressor unloader lever (figure 4-37).

(10) Attach suitable lifting device to eyebolt on top of compressor stator and remove air compressor assembly from unit as shown in figure 5-6.



TS5-4310-354-14/5-6

REMOVAL

STEP 1. DISCONNECT OIL LINES FROM THERMAL BYPASS VALVE ASSEMBLY. REMOVE CAP SCREWS, LOCK WASHERS, OIL FILTER-BYPASS ASSEMBLY AND GASKET.

STEP 2. REMOVE CAP SCREWS AND LOCK WASHERS. CAREFULLY MOVE COMPRESSOR ASSEMBLY AWAY FROM ENGINE TO DISCONNECT DRIVE PINS AND BUSHINGS.

STEP 3. LIFT AIR COMPRESSOR OUT OF UNIT.

INSTALLATION

STEP 1. POSITION AIR COMPRESSOR ON UNIT. ALIGN COMPRESSOR DRIVE COUPLING WITH DRIVE PINS AND BUSHINGS ON ENGINE FLYWHEEL.

STEP 2. INSTALL LOCK WASHERS AND CAP SCREWS ATTACHING AIR COMPRESSOR ASSEMBLY TO ENGINE FLYWHEEL HOUSING.

STEP 3. INSTALL A NEW GASKET, OIL FILTER-BYPASS VALVE ASSEMBLY, ATTACH ASSEMBLY TO COMPRESSOR WITH LOCK WASHERS AND CAP SCREWS. CONNECT OIL LINES.

Figure 5-6. Air compressor assembly, removal and installation.

b. Installation.

(1) Install the air compressor assembly on the unit as shown in figure 5-6.

(2) Connect the speed control rod stop block to compressor unloader lever. Connect speed control rod return spring (figure 4-37).

(3) Connect the idle control cable and compressor unloader cable (para 4-63).

(4) Connect the oil separator inlet hose (figure 5-4). Install compressor oil temperature sensing bulb (para 4-56) and oil temperature shutdown switch (para 4-70).

(5) Install the blowdown valve assembly (figure 5-5).

(6) Install the compressor air intake lines, hoses, and fittings (figures 4-21 and 4-22).

(7) Assemble the compressor enclosure components removed to gain access to the compressor (figure 4-17).

(8) Install the compressor and engine air cleaner assemblies (figure 4-15).

(9) Install the exterior components of compressor enclosure removed to gain access to compressor (figure 4-12).

(10) Install the engine exhaust muffler (figure 4-9).

5-12. Engine Assembly.

a. Removal.

(1) Remove the engine exhaust muffler group (figure 4-9).

(2) Remove the exterior components of enclosure group (figure 4-12), quick start assembly (figure 4-13), overspeed switch (figure 4-14), and the engine and compressor air cleaners (figure 4-15).

(3) Disassemble the compressor enclosure group to extent necessary to gain access to the engine assembly (figure 4-17).

(4) Remove the radiator and oil cooler group (figure 4-18).

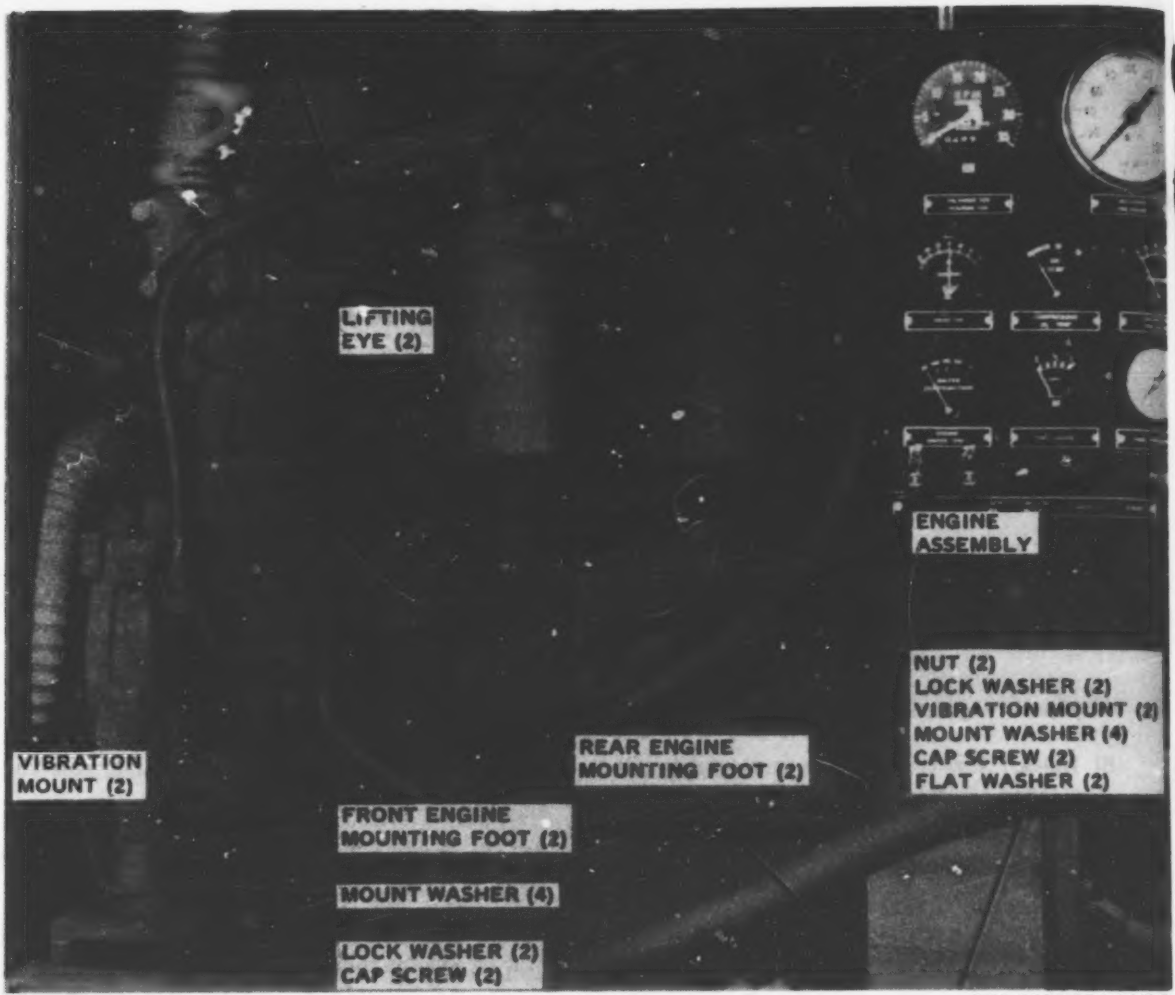
(5) Disconnect the fuel lines, hoses, and fittings as necessary to remove the engine assembly (figure 4-20).

(6) Remove the air lines, hoses, and fittings (figures 4-21 and 4-23).

(7) Remove the instrument panel assembly (figure 4-33).

(8) Remove the air compressor assembly (para 5-11).

(9) Attach a suitable lifting device to the lifting eyes on the engine assembly and remove the assembly from the unit as shown in figure 5-7.


LIFTING EYE (2)
ENGINE ASSEMBLY
NUT (2)
LOCK WASHER (2)
VIBRATION MOUNT (2)
MOUNT WASHER (4)
CAP SCREW (2)
FLAT WASHER (2)
VIBRATION MOUNT (2)
REAR ENGINE MOUNTING FOOT (2)
FRONT ENGINE MOUNTING FOOT (2)
MOUNT WASHER (4)
LOCK WASHER (2)
CAP SCREW (2)

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REMOVAL

STEP 1. REMOVE NUTS, LOCK WASHERS, VIBRATION MOUNT WASHERS, CAP SCREWS, AND FLAT WASHERS THAT ATTACH REAR ENGINE MOUNTING FEET AND VIBRATION MOUNTS TO FRAME.

STEP 2. REMOVE CAP SCREWS, LOCK WASHERS, VIBRATION MOUNT WASHERS, AND CAP SCREWS THAT ATTACH FRONT ENGINE MOUNTING FEET TO FRAME.

STEP 3. LIFT ENGINE ASSEMBLY OFF UNIT. AS NECESSARY, REMOVE THE ENGINE VIBRATION MOUNTS FROM FRAME.

INSTALLATION

STEP 1. AS NECESSARY, INSTALL ENGINE VIBRATION MOUNTS ON FRAME. POSITION ENGINE ASSEMBLY ON THE UNIT FRAME WITH ONE VIBRATION MOUNT WASHER BETWEEN EACH VIBRATION MOUNT AND ENGINE MOUNTING FEET, FRONT AND REAR.

STEP 2. INSTALL VIBRATION MOUNT WASHERS, LOCK WASHERS, AND CAP SCREWS SECURING FRONT ENGINE MOUNTING FEET TO FRAME.

STEP 3. INSTALL FLAT WASHERS, CAP SCREWS, VIBRATION MOUNT WASHERS, LOCK WASHERS, AND NUTS TO SECURE REAR ENGINE MOUNTING FEET TO FRAME.

Figure 5-7. Engine assembly, removal and installation.

b. *Testing.*

(1) Perform test equal to Production Test Method Series 4000, Military Standard MIL-STD-1400B.

(2) Use Test Equipment and Data in accordance with para 2, Test Method Series 4000, MIL-STD-1400B.

(3) Perform Initial Examination in accordance with Test Method 4100, MIL-STD-1400B.

(4) Perform Check Test and Run-In in accordance with Test Method 4200, MIL-STD-1400B.

(5) Proposed engine rating (bare engine) is:

(a) Maximum rpm, 2100. Idle 800 rpm.

(b) Commercial maximum rating, 61 hp. (Corrected power based on 29.92" Hg barometer pressure, air temperature 60°F.)

(c) Continuous speed, continuous load rating, 46 hp. (Corrected power based on 29.00" Hg barometer pressure, air temperature 85°F. Ref para 3.3.2, MIL-STD-1400B.)

c. *Installation.*

(1) Install the engine assembly on the unit frame as shown in figure 5-7.

(2) Install the air compressor assembly (para 5-11).

(3) Install the instrument panel assembly (figure 4-33).

(4) Install the air lines, hoses, and fittings (figures 4-21 and 4-22).

(5) Connect the fuel lines, hoses, and fittings as necessary (figure 4-20).

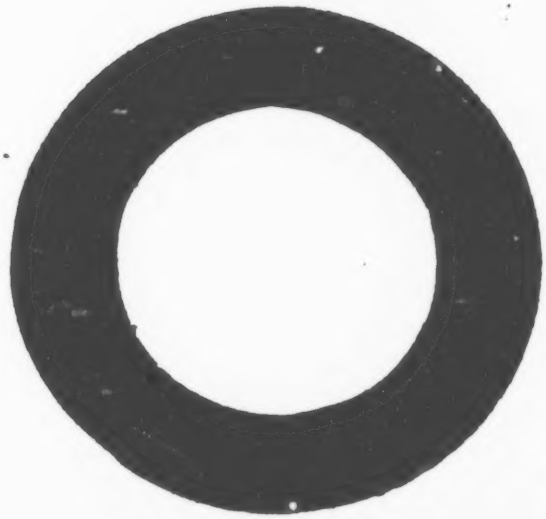
(6) Install the radiator and oil cooler group (figure 4-18).

(7) Assemble the compressor enclosure group, as necessary (figure 4-17).

(8) Install the engine and compressor air cleaners (figure 4-15), overspeed switch (figure 4-14), quick start assembly (figure 4-13), and the enclosure exterior components (figure 4-12).

(9) Install the engine exhaust muffler group (figure 4-9).

(10) Start the engine and check for leaks.



CHAPTER 6

REPAIR OF AIR COMPRESSOR

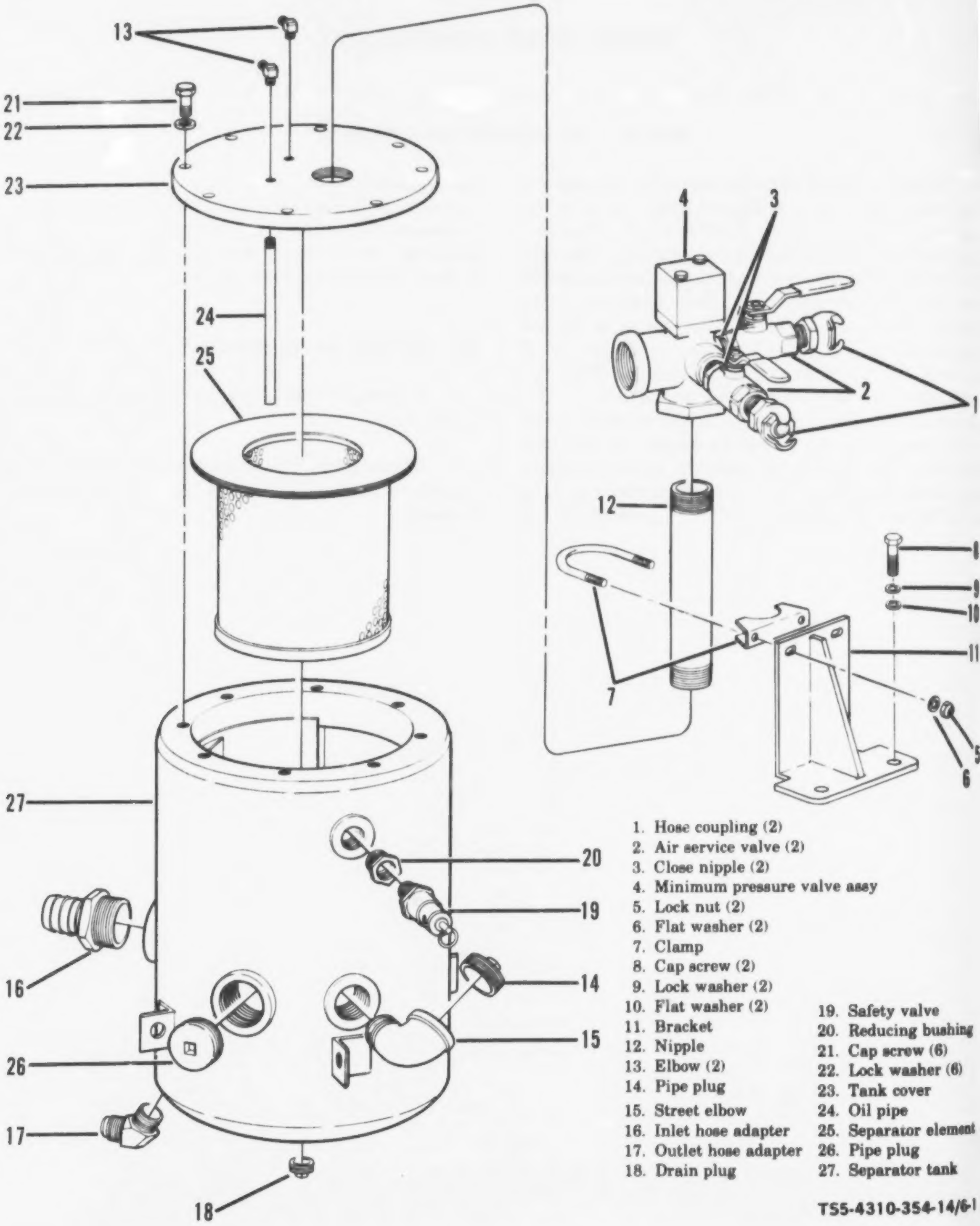
Section I. OIL SEPARATOR ASSEMBLY

6-1. General. The oil separator assembly consists of a labyrinth type tank, a minimum pressure valve assembly, air service valves, oil filler elbow, filter element, and a safety valve. The compressed air-oil mixture is discharged from the air compressor assembly into the oil separator tank. The mixture swirls through the tank labyrinth where most of the oil separates from the air and returns to the bottom of the tank. The air then passes through the filter element which removes the remainder of the oil. The oil-free air then flows through the minimum pressure valve assembly to the air service valves and hose reel assembly. The minimum pressure valve assembly maintains a pressure within the separator tank to effect the air-oil separation and to circulate the oil throughout the air compressor system. The safety valve protects the system from abnormally high air pressure. The safety valve opens and vents the separator tank air to atmosphere if the pressure within the tank exceeds 125 psi.

6-2. Oil Separator Assembly.

a. Removal. Remove the oil separator assembly (para 5-9).

b. Disassembly. Disassemble the oil separator assembly in numerical sequence shown in figure 6-1 as follows:



1. Hose coupling (2)
2. Air service valve (2)
3. Close nipple (2)
4. Minimum pressure valve assy
5. Lock nut (2)
6. Flat washer (2)
7. Clamp
8. Cap screw (2)
9. Lock washer (2)
10. Flat washer (2)
11. Bracket
12. Nipple
13. Elbow (2)
14. Pipe plug
15. Street elbow
16. Inlet hose adapter
17. Outlet hose adapter
18. Drain plug
19. Safety valve
20. Reducing bushing
21. Cap screw (6)
22. Lock washer (6)
23. Tank cover
24. Oil pipe
25. Separator element
26. Pipe plug
27. Separator tank

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Figure 6-1. Oil separator assembly, disassembly and reassembly.

(1) Unscrew and remove two hose couplings (1), two air service valves (2), two close nipples (3), and the minimum pressure valve assembly (4). (Refer to paragraph 6-3 for minimum pressure valve assembly details.)

(2) Remove two lock nuts (5), two flat washers (6) and clamp (7). Remove two cap screws (8), two lock washers (9), two flat washers (10), and bracket (11). Unscrew and remove nipple (12) from tank cover (23).

(3) Remove two elbows (13), pipe plug (14), and street elbow (15). Make note of the angle of the street elbow in relation to the tank or scribe a mark on the tank and elbow for assembly reference. The angle is not critical but makes filling with oil easier if near this same angle when reassembled.

(4) Remove the inlet hose adapter (16), outlet hose adapter (17), and drain plug (18). Remove safety valve (19) and reducing bushing (20).

(5) Remove six cap screws (21) and six lock washers (22). Remove the tank cover (23) by lifting straight up until oil pipe (24) is clear of the element (25). Remove the oil pipe (24) from tank cover (23).

(6) Lift the element (25) out of the separator tank (27). It is not necessary to remove pipe plug (26) from separator tank (27) unless replacement of pipe plug is required.

c. Cleaning, Inspection, and Repair.

(1) Clean parts, except element (25, figure 6-1) in accordance with para 5-7*f*.

(2) Inspect element (25) for holes, varnish condition, damage to flange gaskets, or any other defect.

(3) Inspect safety valve (19) for proper operation.

(4) Inspect minimum pressure valve assembly (4) in accordance with para 6-3.

(5) Inspect all parts for cracks, breaks, distortion, damaged threads, or any other defect.

(6) Repair of the oil separator assembly is limited to the replacement of all defective parts.

d. Testing. Test the safety valve (19, figure 6-1) for proper operation as follows:

(1) Connect the safety valve to a controlled air source capable of producing a minimum of 175 psi air pressure. Provide an air pressure gauge downstream to the control valve.

(2) Open the control valve slowly observing the pressure gauge. Note the pressure at which the safety valve opens. The safety valve should open at approximately 140 psi, which is the factory setting. Reduce test air pressure by closing control valve to pressure below "popping" pressure.

(3) The safety valve can be adjusted plus or minus 14 psi by turning the slotted adjusting screw on the top of the valve clockwise to increase spring tension and counterclockwise to decrease tension.

(4) Pull on the safety valve stem ring to make certain valve will open and seat properly. Check for leaking by applying a soapy water solution on the valve. Leaking is indicated by bubbling of the solution. If the safety valve leaks or is not functioning properly, replace the safety valve.

(5) Close the test air control valve, relieve the line pressure to the safety valve, and remove the safety valve from test setup.

e. Reassembly. Reassemble the oil separator assembly in the reverse numerical sequence shown in figure 6-1 as follows:

(1) If pipe plug (26) was removed at disassembly, install pipe plug (26) in separator tank (27). Assemble element (25) into tank (27).

(2) Assemble oil pipe (24) to underside of tank cover (23). Assemble tank cover (23) onto tank (27) being careful not to damage element (25) with oil pipe (24). Secure cover to tank with six lock washers (22) and six cap screws (21).

(3) Install reducing bushing (20) and safety

valve (19). Install drain plug (18), outlet hose adapter (17), and inlet hose adapter (16).

(4) Install street elbow (15) in tank (27) at an angle as close as possible to the same angle as it was before disassembly (refer to para 6-2.*b*.(3)). Install pipe plug (14) in street elbow (15). Install two elbows (13).

(5) Screw nipple (12) into tank cover (23). Attach bracket (11) to separator tank with two flat washers (10), two lock washers (9), and two cap screws (8). Assemble clamp (7) on nipple (12) and attach to bracket (11) with two flat washers (6) and two lock nuts (5).

(6) Screw minimum pressure valve assembly (4) onto nipple (12). Install two close nipples (3), two air service valves (2), and two hose couplings (1).

f. Installation. Install the oil separator assembly (para 5-9).

6-3. Minimum pressure valve assembly.

a. Disassembly. Disassemble the minimum pressure valve assembly in the numerical sequence shown in figure 6-2 as follows:

(1) Remove two cap screws (1) and two lock washers (2). Carefully remove valve cover (3) and piston spring (4).

(2) Remove the valve piston (5) and remove o-ring (6) from piston.

b. Cleaning, Inspection, and Repair.

(1) Clean all parts in accordance with para 5-7.*f*.

(2) Inspect all parts for cracks, breaks, distortion, damaged threads, or any other defect.

(3) Discard o-ring (6, figure 6-2) at disassembly and replace.

(4) Repair is limited to replacement of defective parts.

c. Reassembly. Reassemble the minimum pressure valve assembly in the reverse numerical sequence shown in figure 6-2 as follows:

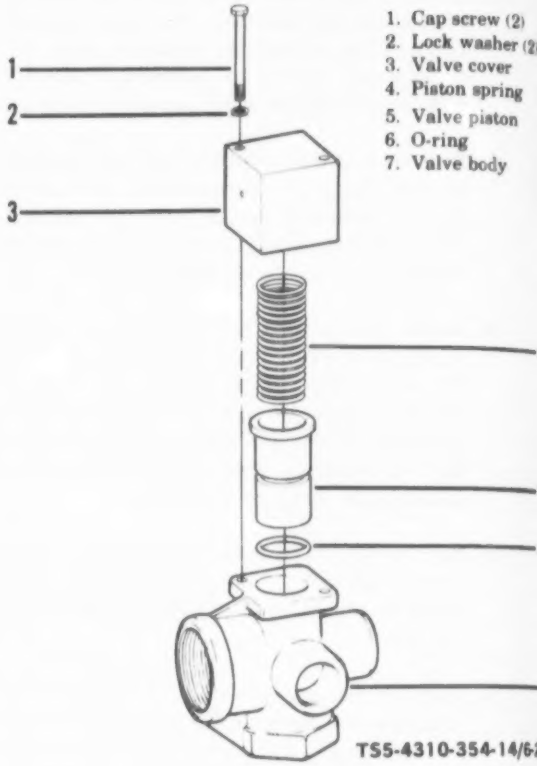

Figure 6-2. Minimum pressure valve assembly, disassembly and reassembly.

(1) Apply a light coating of clean lubricating o
or petroleum jelly on o-ring (6) to make a
sembly easier. Install o-ring (6) in groov
provided on valve piston (5). Assemble valv
piston (5) in valve body (7).

(2) Assemble piston spring (4), valve cover (3
and attach cover to valve body (7) with tw
lock washers (2) and two cap screws (1).

d. Testing. After reassembly of the minimu
pressure valve assembly, test as follows:

(1) Attach the inlet of the minimum pressu
valve assembly to a controlled air sourc
capable of producing a minimum of 100 p
air pressure. The air source should have
pressure gauge between the control valv
and the minimum pressure valve assembly

(2) Open the air source control valve slowl
while observing the pressure gauge. Th

minimum pressure valve piston should lift off its seat at approximately 70 psi allowing air to pass through the valve.

(3) Close the control valve reducing the test pressure to less than 70 psi. Spring pressure on the piston should seat the piston stopping flow of test air through the minimum pressure valve assembly. Should the assembly not function in this manner, the spring (4, figure 6-2) and o-ring (6) shall be replaced.

(4) Close the test air control valve and remove the minimum pressure valve assembly from the test setup.

6-4. Oil Separator Element.

a. Removal.

(1) Disconnect air lines necessary for removal of oil separator cover (figure 4-22).

(2) Remove the hose reel assembly (para 4-25.*a*).

(3) Remove oil separator cover and element in the numerical sequence shown in figure 6-3 as follows:

(a) Remove two cap screws (1), two lock washers (2), and two flat washers (3) located at support bracket.

(b) Remove the remaining six cap screws (4) and six lock washers (5) attaching cover assembly (6) to separator tank (8).

(c) Lift cover assembly (6) straight up so that separator element (7) is not damaged by oil pipe attached to the underside of the cover assembly (6). Lift out the separator element (7).

b. Inspection. Inspect the element (7, figure 6-3) for holes, varnishing condition, distortion, or any other defect.

KEY to figure 6-3:

1. Cap screw (2)
2. Lock washer (2)
3. Flat washer (2)
4. Cap screw (6)
5. Lock washer (6)
6. Cover assembly
7. Separator element
8. Separator tank

c. Installation.

(1) Install the oil separator element in the reverse numerical sequence shown in figure 6-3 as follows:

(a) Install separator element (7) in separator tank (8) with flange of element resting on top of tank.

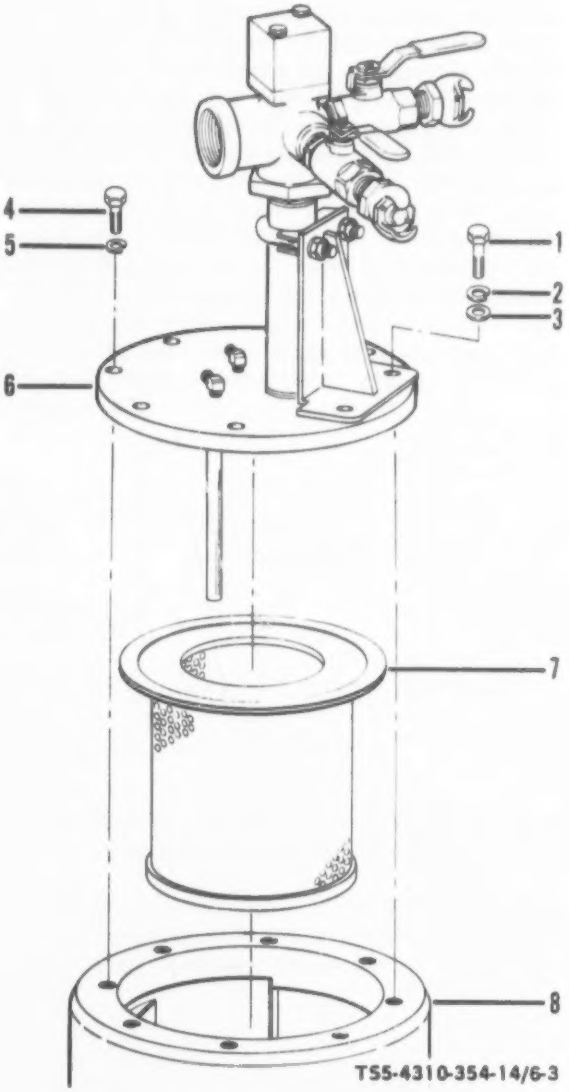

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Figure 6-3. Oil separator element, removal and installation.

(b) Install cover assembly (6) on top of separator tank (8) being careful not to damage element with oil pipe on underside of cover assembly (6).

(c) Attach cover assembly (6) to separator tank (8) with six lock washers (5), six cap screws (4), two flat washers (3), two lo washers (2), and two cap screws (1).

(2) Install the hose reel (para 4-25*g*).

(3) Connect air lines to oil separator cover f ting (figure 4-22).

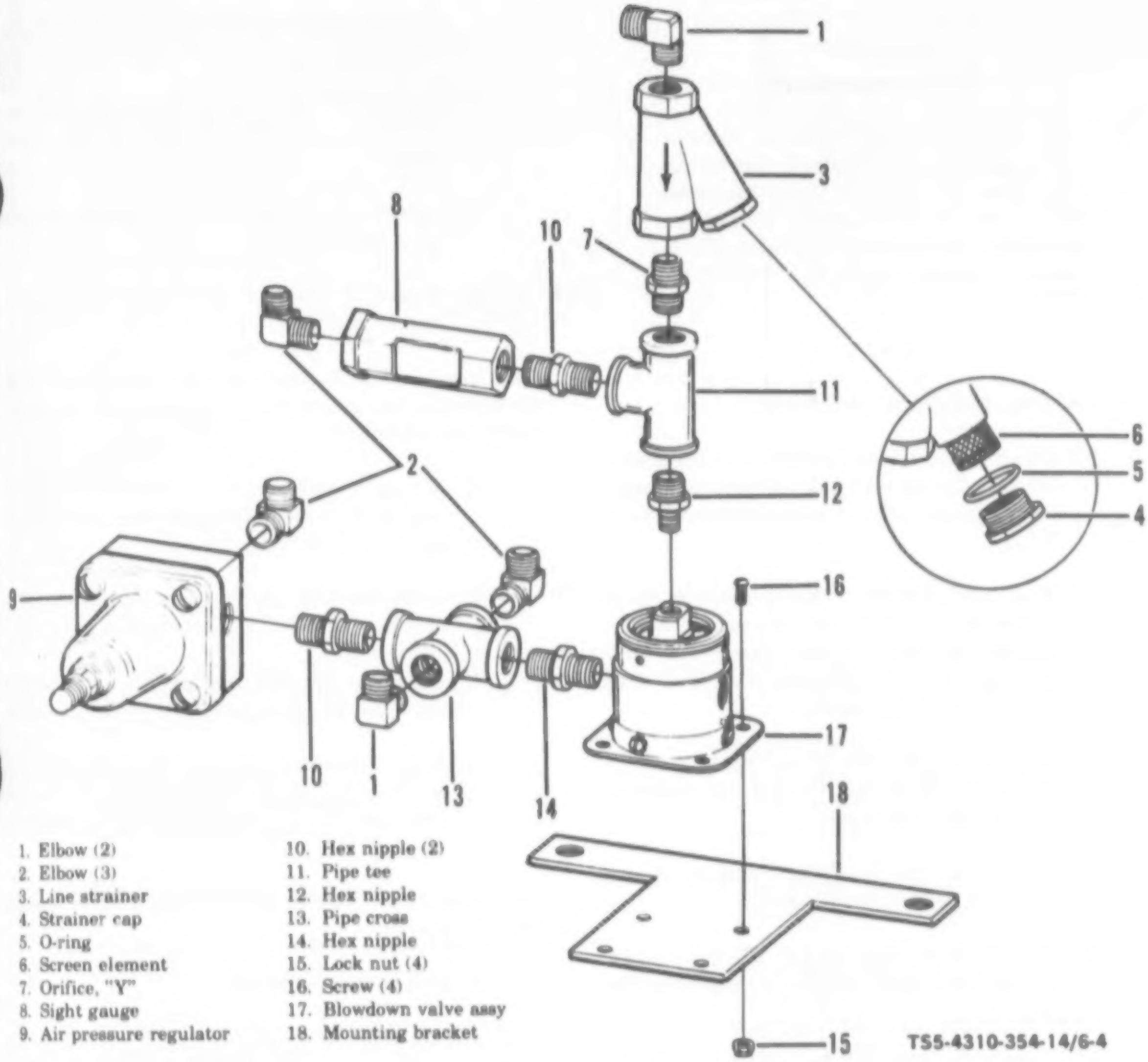
Section II. BLOWDOWN VALVE ASSEMBLY

6-5. General. The blowdown valve assembly consists of a line strainer, oil flow sight gauge, blowdown valve assembly, and the air pressure regulator assembly. Control air flows from the oil separator assembly to the inlet side of the air pressure regulator which in turn regulates the operation of the intake control mechanism and engine speed in relation to air demand. When the unit is shut down, the compressed air in the system is relieved to atmosphere through the blowdown valve assembly. Oil filtered from the air, by passing through the oil separator element, drops to the bottom of the element. This oil is picked up and returned to the compressor intake control housing where it is again introduced into the compressor oil system. As this air/oil mixture flows from the separator element, it passes through a li strainer where minute particles of contaminants t may be present are removed. The mixture then p ses through a flow sight gauge which will show percolating action of the oil while the unit is runni loaded.

6-6. Blowdown Valve Assembly.

a. Removal. Remove the blowdown valve assem from the unit (figure 5-5).

b. Disassembly. Disassemble the blowdown val assembly in the numerical sequence shown in figu 6-4 as follows:



1. Elbow (2)
2. Elbow (3)
3. Line strainer
4. Strainer cap
5. O-ring
6. Screen element
7. Orifice, "Y"
8. Sight gauge
9. Air pressure regulator
10. Hex nipple (2)
11. Pipe tee
12. Hex nipple
13. Pipe cross
14. Hex nipple
15. Lock nut (4)
16. Screw (4)
17. Blowdown valve assy
18. Mounting bracket

TS5-4310-354-14/6-4

Figure 6-4. Blowdown valve assembly, disassembly and reassembly.

(1) Remove the two elbows (1), three elbows (2), and line strainer (3). Remove strainer cap (4), o-ring (5), and screen element (6).

(2) Remove orifice (7) and sight gauge (8). Remove air pressure regulator (9) and two hex nipples (10). Refer to paragraph 6-7 for air pressure regulator (9) details.

(3) Remove pipe tee (11), hex nipple (12), pipe cross (13), and hex nipple (14).

(4) Remove four lock nuts (15), four screws (16), and separate blowdown valve assembly (17) from mounting bracket (18).

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F-130°F (38°C-59°C).

c. *Cleaning, Inspection, and Repair.*

(1) Clean parts, except blowdown valve assembly (17, figure 6-4) and air pressure regulator assembly (9), in accordance with para 5-7*f*.

(2) Wipe the exterior of the blowdown valve assembly (17) and air pressure regulator assembly (9) with a cloth dampened with solvent, Federal Specification P-D-680, Type II. Dry thoroughly.

(3) Inspect line strainer screen element (6) for punctures, distortion, varnishing condition, or any other damage.

(4) Inspect "Y" orifice (7) for plugging of passage and for damaged threads.

(5) Inspect flow sight gauge (8) for cracks, breaks, damaged threads, or any other defect.

(6) Inspect blowdown valve assembly (17) for any distortion, cracks, breaks, damaged threads, proper operation, or any other defect.

(7) Inspect all other parts for cracks, breaks, plugging, damaged threads, or any other defect.

(8) Refer to paragraph 6-7 for air pressure regulator inspection.

(9) Repair is limited to the replacement of defective parts.

d. *Reassembly.* Reassemble the blowdown valve assembly in the reverse numerical sequence shown in figure 6-4 as follows:

(1) Attach blowdown valve assembly (17) to mounting bracket (18) with four screws (16) and four lock nuts (15).

(2) Assemble hex nipple (14), pipe cross (13), and hex nipple (12). Install pipe tee (11).

(3) Assemble two hex nipples (10), air pressure regulator (9), sight gauge (8), and orifice (7).

(4) Assemble screen element (6), o-ring (5), and strainer cap (4) in line strainer (3). Install line strainer (3), three elbows (2), and two elbows (1).

e. *Installation.* Install the blowdown valve assembly (figure 5-5).

6-7. Air Pressure Regulator.

a. *Disassembly.* Disassemble the air pressure regulator assembly in the numerical sequence shown in figure 6-5 as follows:

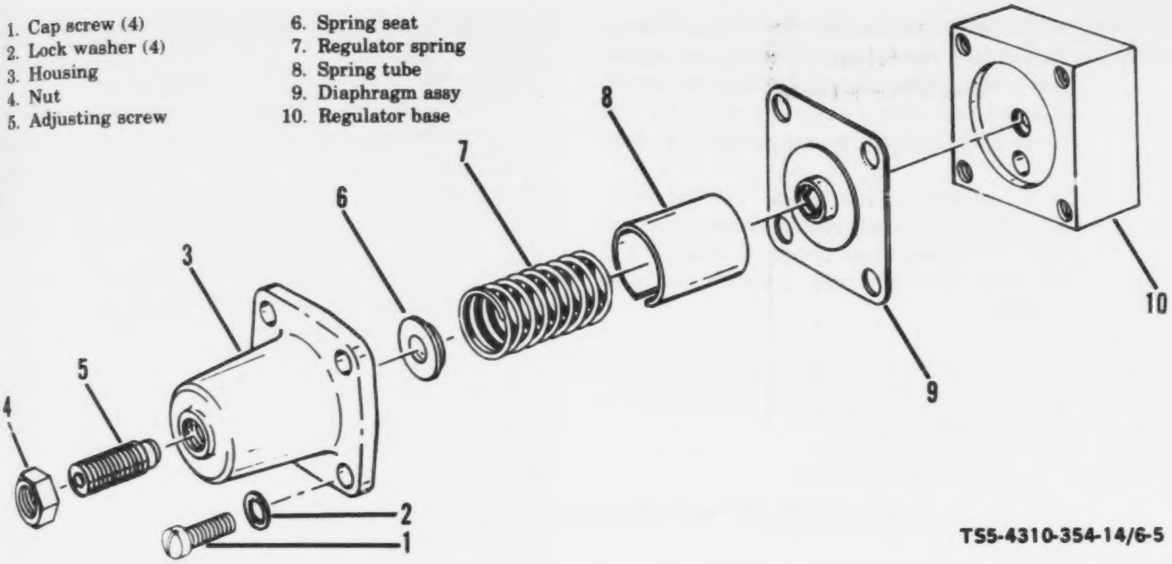

1. Cap screw (4)
2. Lock washer (4)
3. Housing
4. Nut
5. Adjusting screw
6. Spring seat
7. Regulator spring
8. Spring tube
9. Diaphragm assy
10. Regulator base

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Figure 6-5. Air pressure regulator assembly, disassembly and reassembly.

(1) Remove four cap screws (1), four lock washers (2), and housing (3). Remove nut (4) and adjusting screw (5).

(2) Remove spring seat (6), regulator spring (7), spring tube (8), and diaphragm assembly (9) from regulator base (10).

b. Cleaning, Inspection, and Repair.

(1) Clean parts, except diaphragm assembly (9, figure 6-5), in accordance with para 5-7.*f*.

(2) Wipe diaphragm assembly (9) clean with a clean, lint-free cloth.

(3) Inspect diaphragm assembly (9) for any cuts, tears, deterioration, or any other defect.

(4) Inspect spring (7) for broken coils, deformation, or any other defect.

(5) Inspect all parts for cracks, breaks, damaged threads, or any other defect.

(6) Replace all defective parts.

c. Reassembly.

(1) Reassemble the air pressure regulator assembly in the reverse numerical sequence shown in figure 6-5 as follows:

(a) Position diaphragm assembly (9) on regulator base (10) with holes aligned and spring guide portion of diaphragm assembly away from base.

(b) Assemble spring tube (8), regulator spring (7), and spring seat (6).

(c) Place housing (3) over these assembled parts, press down on housing (3) to seat against base (10). Attach housing (3) to base (10) with four lock washers (2) and four cap screws (4).

(d) Install adjusting screw (5) and nut (4).

(e) Test and adjust the air pressure regulator in accordance with paragraph 6-7.*d*.

(2) Reassemble air pressure regulator on blowdown valve assembly (para 6-6.*d*).

d. Testing and Adjustment. After installing air pressure regulator on unit, check air line connections (figure 5-1). Start the equipment in accordance with para 2-2.*b* and figure 2-6. Test and adjust the air pressure regulator as follows:

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(1) With air discharge service valves closed, and engine operating at idle speed, adjust air pressure regulator adjusting screw (5, figure 6-5) to obtain a reading of 115-117 psi (8.08-8.54 KG/CM^2) on air pressure gauge.

(2) If air pressure rises above 117 psi (8.54 KG/CM^2), turn adjusting screw counterclockwise to decrease pressure, if below 115 psi (8.08 KG/CM^2) turn clockwise to raise pressure.

(3) Bleed off excess air by opening air discharge service valve. After excess air is discharged, close service valve.

(4) Readjust regulator adjusting screw, as necessary.

(5) Cycle the air compressor several times by opening and closing the air discharge service valve. Observe air pressure gauge each time to ensure pressure setting remains stable.

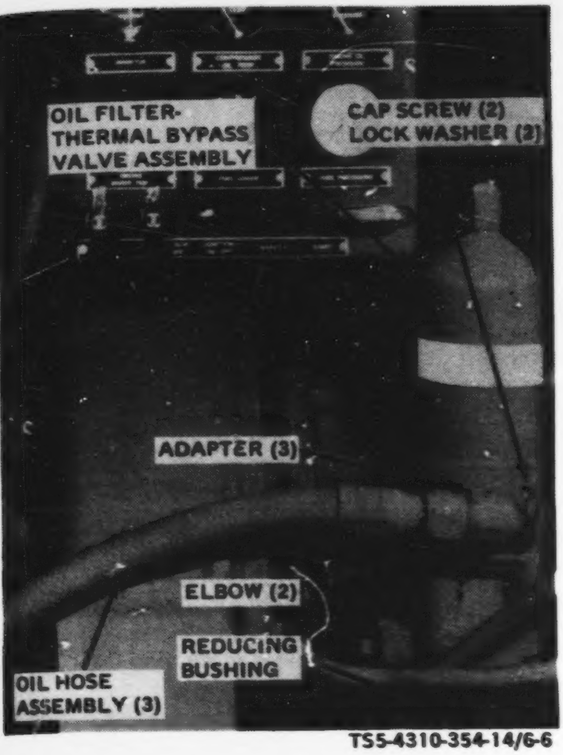
(6) Tighten nut (4, figure 6-5) to secure adjusting screw after pressure is set.

Section III. OIL FILTER-THERMAL BYPASS VALVE ASSEMBLY

6-8. General. The thermal bypass valve portion of this assembly provides rapid warming of the compressor at initial start by directing oil flow from the oil separator assembly, through the compressor oil filter, into the compressor (figure 5-2). When the oil temperature reaches approximately 150°F (66°C), the thermal bypass valve begins to open and directs part of the oil through the oil cooler before it enters the oil filter. At approximately 180°F (82°C), the thermal bypass valve is fully open and all oil flow is through the oil cooler. Between these two temperatures, hot and cool oil is being mixed to maintain a relatively constant minimum operating temperature.

6-9. Oil Filter-Thermal Bypass Valve Assembly.

a. Removal. Remove the oil filter-thermal bypass valve assembly as shown in figure 6-6.


OIL FILTER-
THERMAL BYPASS
VALVE ASSEMBLY
CAP SCREW (2)
LOCK WASHER (2)
ADAPTER (3)
ELBOW (2)
REDUCING
BUSHING
OIL HOSE
ASSEMBLY (3)

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REMOVAL

STEP 1. DISCONNECT OIL HOSE ASSEMBLIES. REMOVE ELBOWS, ADAPTER, AND REDUCING BUSHINGS, AS NECESSARY.

STEP 2. REMOVE CAP SCREWS AND LOCK WASHERS. REMOVE OIL FILTER-THERMAL BYPASS VALVE ASSEMBLY AND GASKET. DISCARD GASKET.

INSTALLATION

STEP 1. USE A NEW GASKET AND INSTALL GASKET AND OIL FILTER-THERMAL BYPASS VALVE ASSEMBLY IN POSITION ON SIDE OF COMPRESSOR. SECURE WITH LOCK WASHERS AND CAP SCREWS.

STEP 2. AS NECESSARY, INSTALL REDUCING BUSHINGS, ADAPTER, AND ELBOWS. CONNECT OIL HOSE ASSEMBLIES.

Figure 6-6. Oil filter-thermal bypass valve assembly, removal an installation.

b. Disassembly. Disassemble the oil filter-thermal bypass valve assembly in the numerical sequence shown in figure 6-7 as follows:

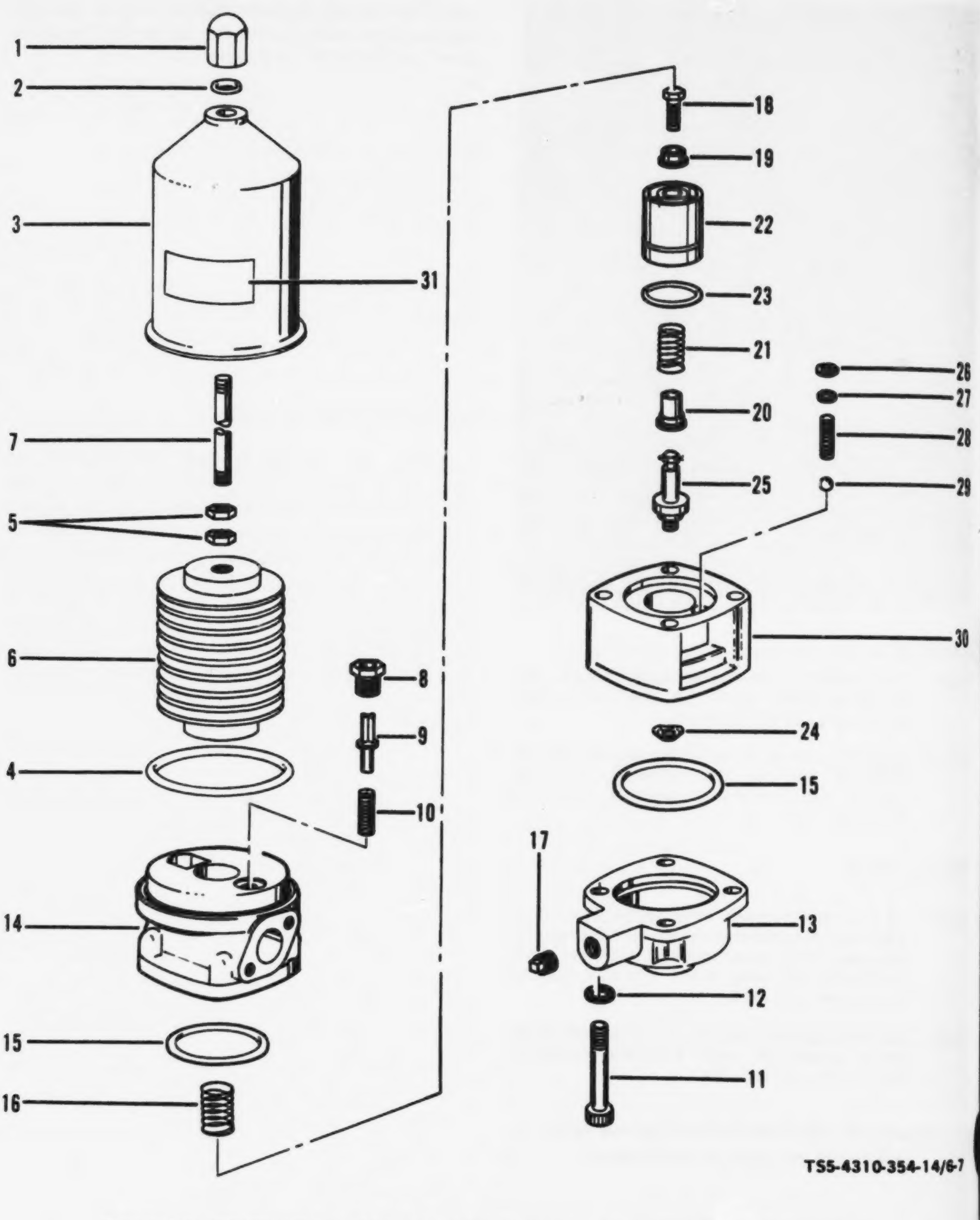
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Figure 6-7. Oil filter-thermal bypass valve assembly, disassembly and reassembly.

KEY to figure 6-7:

1. Acorn nut
2. O-ring
3. Filter housing
4. O-ring
5. Nut (2)
6. Filter element
7. Element stud
8. Valve plug
9. Bypass valve
10. Valve spring
11. Cap screw (4)
12. Lock washer (4)
13. Cover
14. Bypass connection
15. O-ring (2)
16. Spring
17. Pipe plug
18. Cap screw
19. Spring guide
20. Plunger
21. Spring
22. Shuttle
23. O-ring
24. Spring nut
25. Power element
26. Retaining ring
27. Flat washer
28. Relief spring
29. Steel ball
30. Valve body
31. Oil filter service decal

(1) Remove the acorn nut (1), o-ring (2), and lift filter housing (3) off of stud and element. Remove o-ring (4).

(2) Unscrew and remove two nuts (5) from stud (7). Lift filter element (6) off stud. The stud (7) need be removed from bypass connection (14) only when replacement is necessary.

(3) Unscrew and remove valve plug (8), bypass valve (9), and valve spring (10).

(4) Remove four cap screws (11), four lock washers (12), separate cover (13) and bypass connection (14) from valve body (30). Remove two o-rings (15) and spring (16). Pipe plug (17) need not be removed except for replacement.

(5) Unscrew and remove cap screw (18), spring guide (19), plunger (20), spring (21), and shuttle (22). Remove o-ring (23) from shuttle (22).

(6) Remove spring nut (24) and power element (25) from valve body (30).

(7) Remove retaining ring (26), flat washer (27), relief spring (28), and steel ball (29) from valve body (30).

(8) Oil filter service decal (31) need not be removed from filter housing (3) except for replacement.

c. *Cleaning, Inspection, and Repair.*

(1) Clean parts in accordance with para 5-7*.f*. Discard o-rings (4, 15, 23, figure 5-7).

(2) Inspect filter housing (3), cover (13), bypass connection (14), and body (30) for cracks, breaks, damaged threads, or any other defect.

(3) Inspect springs (10, 16, 21, 28) for cracks, breaks, distorted coils, or any other defect.

(4) Inspect power element (25) for distortion, jamming, damaged threads, or any other defect.

(5) Inspect oil filter element (6) for bent, distorted, or ruptured screen discs.

(6) Inspect all parts for cracks, breaks, distortion, damaged threads, or any other defect.

(7) Replace all damaged parts.

CAUTION

During reassembly, do not overtighten the power element attaching spring nut (24). Overtightening can cause distortion of the power element (25) resulting in a malfunction.

d. Reassembly. Reassemble the oil filter-thermal bypass valve assembly in the reverse numerical sequence shown in figure 6-7 as follows:

(1) Attach new oil filter service decal (31) to filter housing (3) as needed.

(2) Assemble steel ball (29), relief spring (28), flat washer (27), and retaining ring (26) into valve body (30).

(3) Place power element (25) in valve body (30) and attach with spring nut (24). Do not over tighten nut (24).

(4) Apply a light coating of clean lubricating oil or petroleum jelly on o-ring (23) and assemble in groove on shuttle (22). Assemble spring (21), plunger (20), spring guide (19), and cap screw (18) to shuttle (22). Using a turning motion, insert shuttle assembly into valve body (30) being careful not to damage o-ring (23).

(5) Place spring (16) on spring guide (19), assemble two o-rings (15), and assemble

bypass connection (14) and cover (13) to valve body (30). Attach with four lock washers (12) and four cap screws (11). If pipe plug (17) was removed, install in cover (13).

(6) Assemble valve spring (10), bypass valve (9), and valve plug (8) in bypass connection (14).

(7) If element stud (7) was removed, install stud in bypass connection (14). Place filter element (6) on stud (7) making certain it seats evenly. Install one nut (5) on stud (7) against filter element (6) finger tight. Hold this nut with a wrench and tighten the second nut (5) against the first, locking the two together.

(8) Place o-ring (4) in groove on top of bypass connection (14), assemble filter housing (3) over element and stud. Attach with o-ring (2) and acorn nut (1).

e. Installation. Install the oil filter-thermal bypass assembly as shown in figure 6-6.

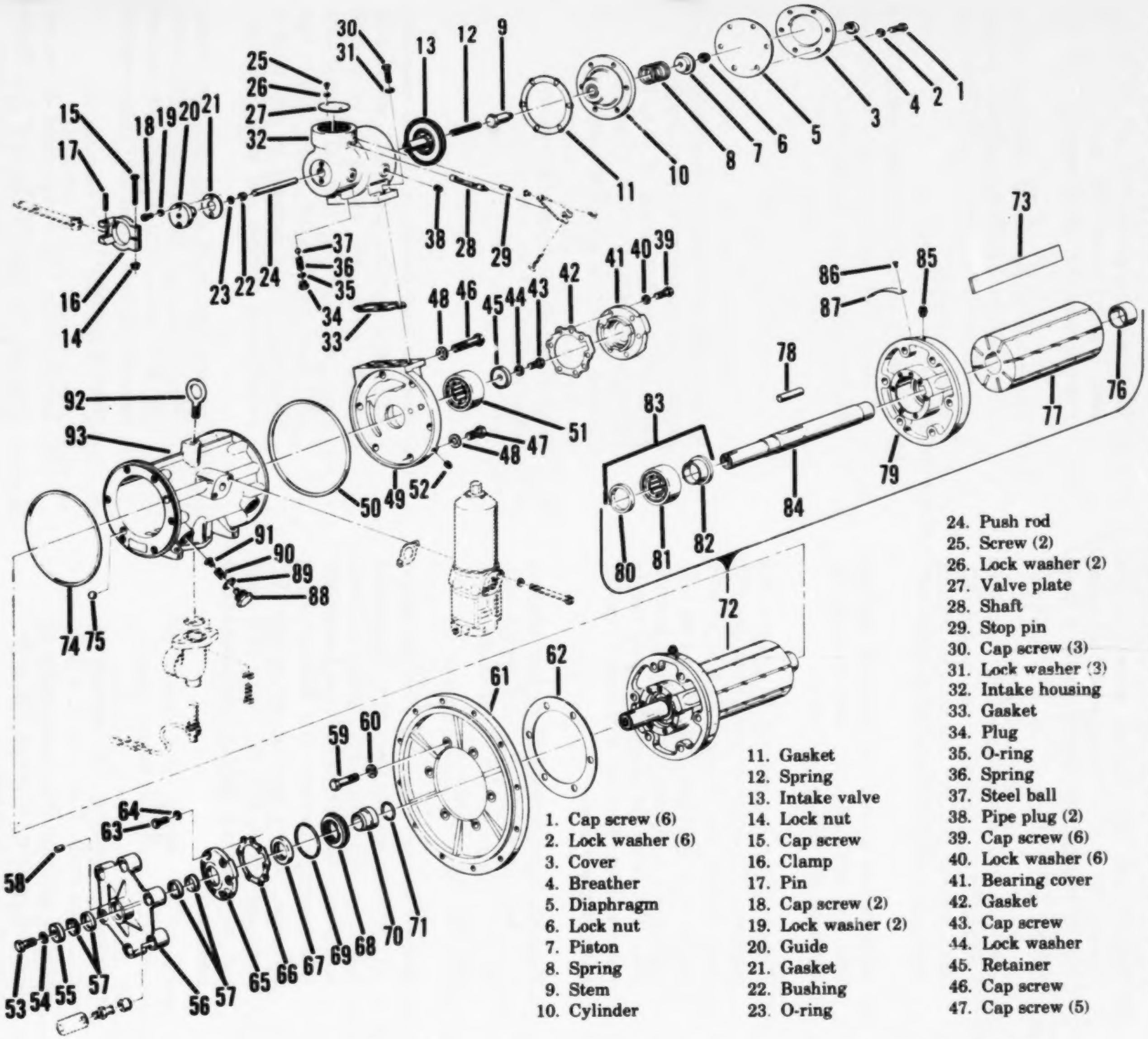
Section IV. AIR COMPRESSOR ASSEMBLY

6-10. General. The air compressor assembly consists of the intake control, a single stage stator, rotor, rotor blades, end covers, flywheel housing adapter, and drive coupling. A valve in the intake control group controls the amount of air that is taken into the compressor. This valve closes and shuts off the air intake when pressure within the oil separator assembly reaches approximately 115 PSI (8.08 KG/CM²). When the intake valve is closed, the compressor is running unloaded. The intake valve also closes when the unit is shut down, thereby preventing any oil and air mixture from the rotor-stator from being vented to atmosphere. When the compressor is running unloaded, a vacuum can develop within the stator and cause internal damage. To prevent this, the air pressure regulator assembly causes the intake control valve to open slightly, which allows just enough air input to prevent vacuum buildup. The compressor stator also incorporates spring loaded drain valves which prevents hydraulic lock within the stator. The rotor is mounted in the stator on a shaft that protrudes through the end covers and is supported, and rotates, on two roller bearings, one in each end cover. Air and oil are drawn into the stator and compressed by the action of the rotor and blades rotating in the eccentric bore of the stator. The compressed air-oil mixture is discharged into the oil separator assembly where a labyrinth chamber and filter element separate the oil from the air. The air then passes through a minimum pressure valve assembly to the service valves and hose reel and the oil is recirculated into the compressor. The air compressor developes an air flow of 125 CFM (3.5 M³/MIN) at a discharge pressure of 100 PSI (7 KG/CM²).

6-11. Air Compressor Assembly.

a. Removal. Remove the air compressor assembly from the unit (para 5-11).

b. Disassembly. Disassemble the air compressor assembly in the numerical sequence shown in figure 6-8 and detailed procedures following.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1. Cap screw (6)
2. Lock washer (6)
3. Cover
4. Breather
5. Diaphragm
6. Lock nut
7. Piston
8. Spring
9. Stem
10. Cylinder
11. Gasket
12. Spring
13. Intake valve
14. Lock nut
15. Cap screw
16. Clamp
17. Pin
18. Cap screw (2)
19. Lock washer (2)
20. Guide
21. Gasket
22. Bushing
23. O-ring
24. Push rod
25. Screw (2)
26. Lock washer (2)
27. Valve plate
28. Shaft
29. Stop pin
30. Cap screw (3)
31. Lock washer (3)
32. Intake housing
33. Gasket
34. Plug
35. O-ring
36. Spring
37. Steel ball
38. Pipe plug (2)
39. Cap screw (6)
40. Lock washer (6)
41. Bearing cover
42. Gasket
43. Cap screw
44. Lock washer
45. Retainer
46. Cap screw
47. Cap screw (5)
48. Seal washer (6)
49. Intake end cover
50. O-ring
51. Bearing outer race
52. Pipe plug
53. Cap screw
54. Lock washer
55. Retainer
56. Drive coupling
57. Grip spring (2)
58. Coupling key
59. Cap screw (6)
60. Seal washer
61. Adapter
62. Gasket
63. Cap screw (6)
64. Lock washer (6)
65. Bearing cover
66. Gasket
67. Oil seal
68. Sealing sleeve
69. O-ring
70. Oil seal sleeve
71. O-ring
72. Drive end cover-rotor group
73. Rotor blade (8)
74. O-ring
75. Steel ball
76. Bearing inner race
77. Rotor
78. Rotor key
79. Drive end cover
80. Bearing ring
81. Bearing outer race
82. Bearing inner race
83. Bearing assembly
84. Rotor shaft
85. Connector
86. Drive pin (2)
87. Serial no. plate
88. Relief plug (2)
89. O-ring (2)
90. Spring (2)
91. Relief valve (2)
92. Eyebolt
93. Stator

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Figure 6-8. Air compressor assembly, disassembly and reassembly.

(1) Remove six cap screws (1), six lock washers (2), intake housing cover (3), breather (4), and diaphragm (5).

(2) Remove cylinder (10) from intake housing (32) and disassemble lock nut (6), piston (7), spring (8), and stem (9) from cylinder (10). Remove gasket (11), spring (12), and intake valve (13).

(3) Remove lock nut (14), cap screw (15), and clamp (16). Pin (17) is removed from clamp (16) for disassembly and assembly of speed control arm only.

(4) Remove two cap screws (18), two lock washers (19), guide (20), and gasket (21). Remove push rod (24). Disassemble bushing (22) and o-ring (23) from guide (20).

(5) Remove two screws (25), two lock washers (26), and valve plate (27). Remove shaft (28) and stop pin (29) as necessary.

(6) Remove three cap screws (30), three lock washers (31), separate intake housing (32) from intake end cover (49) and remove gasket (33). Remove plug (34), o-ring (35), spring (36), and steel ball (37) from housing (32). The two pipe plugs (38) need not be removed from housing (32) unless replacement is necessary.

(7) Remove six cap screws (39), six lock washers (40), bearing cover (41), and gasket (42). Remove cap screw (43), lock washer (44), and bearing retainer (45).

(8) Remove one cap screw (46), five cap screws (47), and six seal washers (48). Tap intake end cover (49) with a soft mallet to break seal of cover to stator. Remove end cover (49) with bearing outer race (51). Remove o-ring (50) and remove bearing outer race (51) from end cover (49). Pipe plug (52) need not be removed unless replacement is necessary.

NOTE

Inner race of bearing (52) remains on end of rotor shaft. The inner race is illustrated as item (76). Disassembly of drive end cover-rotor group (72) is detailed in step (16) below.

(9) Remove cap screw (53), lock washer (54), and retainer (55). Tap drive coupling (56) with a soft mallet and remove the coupling (56), two grip springs (57), and coupling key (58).

(10) Remove six cap screws (59), six seal washers (60), engine mounting adapter (61), and gasket (62).

(11) Remove six cap screws (63), six lock washers (64), bearing cover (65), and gasket (66). Press oil seal (67) out of bearing cover (65).

(12) Remove sealing sleeve (68) and remove o-ring (69) from sealing sleeve (68). Remove oil seal sleeve (70) and o-ring (71) from rotor shaft extension.

(13) Pull the drive end cover-rotor group (72) out of stator (93) removing the eight rotor blades (73), o-ring (74), and steel ball (75).

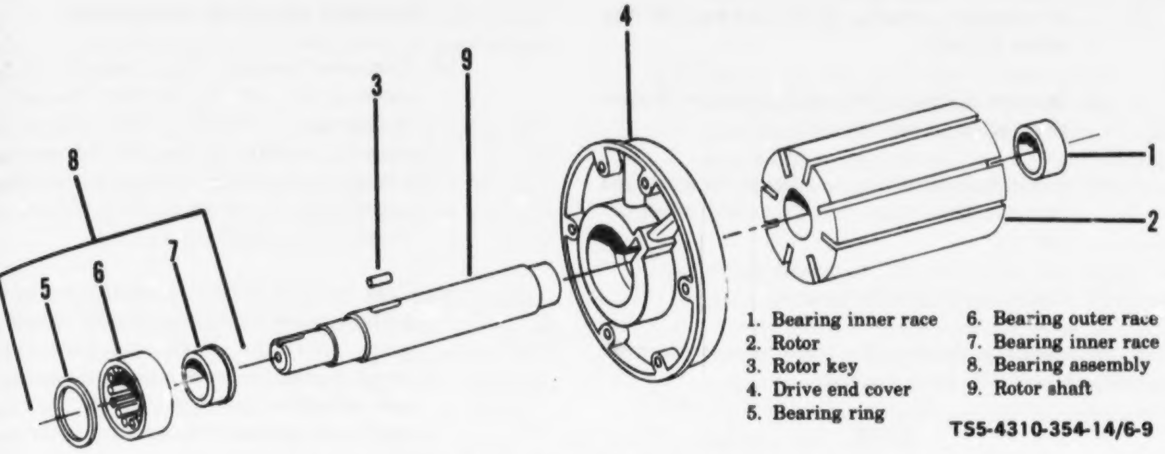
NOTE

Refer to step (16) below for detailed disassembly of the drive end cover-rotor group (72) which consists of items (76 through 84). However, it is recommended that this group of parts not be disassembled unless inspection reveals defective parts that required replacement.

(14) Remove hose connector (85) as necessary. The serial number plate (87), attached by two drive pins (86), should not be removed from end cover (79). If serial number plate (87) must be replaced, make certain data from old plate is stamped on new plate to retain serial number and model number.

(15) Remove two relief plugs (88), two o-rings (89), two springs (90), and two relief valves (91) from stator (93). Eyebolt (92) need not be removed from stator (93) unless replacement is necessary.

(16) Disassemble the compressor drive end cover-rotor group (72, figure 6-8) in the sequence following. Refer to figure 6-9.



1. Bearing inner race
2. Rotor
3. Rotor key
4. Drive end cover
5. Bearing ring
6. Bearing outer race
7. Bearing inner race
8. Bearing assembly
9. Rotor shaft

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Figure 6-9. Drive end cover-rotor, disassembly and reassembly.

CAUTION

Do not heat bearing inner races (1, 7, figure 6-9) to remove unless it is intended to replace the entire bearing. Excessive heat causes softening of the metal; therefore, any bearing heated for removal shall be replaced.

(a) Remove bearing ring (5) from rotor shaft extension. Use a gear puller, or equivalent, and pull bearing inner race (1) from rotor shaft (9).

NOTE

If inner race (1) cannot be removed with a puller, use a torch to heat the race evenly. While race is still hot, pull off of shaft as quickly as possible. Discard entire bearing when race was removed by heating.

(b) Remove rotor (2) from rotor shaft (9) and remove rotor key (3) from shaft (9) keyway.

(c) Remove drive end cover (4) from rotor shaft (9). Remove bearing outer race (6).

(d) Use a gear puller, or equivalent, and pull bearing inner race (7) off of rotor shaft (9).

NOTE

If inner race (7) cannot be removed with a puller, use a torch to heat the race evenly. While race is still hot, pull off of shaft as quickly as possible. Discard entire bearing (8) when race (7) is removed by heating.

c. *Cleaning, Inspection, and Repair.*

(1) Clean all parts in accordance with para 5-7*f*. Discard all gaskets and o-rings.

(2) Inspect all springs for defective coils, cracks, distortion, or any other defect.

(3) Inspect intake control diaphragm (5, figure 6-8) for rupture, deterioration, or any other defect.

(4) Inspect intake valve (13) for cracks, distortion, condition of seat, excessive wear, or any other defect.

(5) Inspect rotor blades (73) for cracks, chipping, excessive wear, or any other defect. If blades are worn on one side only, they can be turned over and reused. Refer to figure 6-11.

(6) Inspect rotor (77, figure 6-8) and stator (93) for cracks, scoring, excessive wear, raised metal, or any other defect.

(7) Inspect bearings (51, 76 and 83) for freedom of rotation, cracks, gritty action, or any other defect.

(8) Inspect all parts for cracks, breaks, distortion, or any other defect.

(9) Inspect all attaching hardware for damaged threads, distortion, cracks, or any other defect.

(10) Replace all defective parts.

d. Reassembly. Reassemble the air compressor assembly in the following sequence.

NOTE

Install all new gaskets and o-rings at reassembly. A compressor overhaul kit consisting of these components is available.

(1) If drive end cover-rotor group (72, figure 6-8) was disassembled, refer to figure 6-9 and reassemble as follows:

CAUTION

Do not use a torch or similar heating method to install bearing inner races (7 and 1, figure 6-9) on rotor shaft (9). Excessive or uneven heat will cause softening of the metal.

(a) Immerse bearing inner race (7) in hot cooking oil, or equivalent, heated to maximum of 350°F (177°C). Allow the race to remain in the hot oil approximately ten minutes; then, while still hot, install race (7) on rotor shaft (9) with race flange against shoulder on shaft.

(b) Assemble end cover (4) over rotor shaft (9) from opposite end of shaft (9) to end where inner race (7) was installed in step (a) above. Install bearing outer race (6) into end cover (4) and over inner race (7).

(c) Install rotor key (3) in shaft (9) keyway. Assemble rotor (2) on rotor shaft (9) with oil drain holes in blade slots positioned on leading edge of slots with respect to rotor rotation (the rotation is clockwise facing the drive end of the compressor).

(d) Immerse bearing inner race (1) in hot cooking oil, or equivalent, heated to maximum of 350°F (177°C). Allow the race to remain in the hot oil approximately ten minutes; then, while still hot, install race (1) on rotor shaft (9) against shoulder on shaft.

(e) Coat the flat surface of bearing ring (5) with a grease or petroleum jelly to hold in place until the drive end cover-rotor group is installed in compressor assembly and assemble the ring (5) over the rotor shaft and against the bearing inner race (7).

(f) Place the assembled drive end cover-rotor group on a work bench until ready to assemble into compressor assembly. This group of preassembled parts is illustrated on figure 6-8 as item (72).

(2) If removed, install eyebolt (92, figure 6-8) in top of stator (93). Assemble two relief valves (91), two springs (90), two o-rings (89), and two relief plugs (88) in stator (93).

(3) Install serial number plate (87) on end cover (79) with two drive pins (86). Install hose connector (85) in end cover (79).

(4) Place steel ball (75) in hole in the end flange of stator (93). Apply a light coating of petroleum jelly on o-ring (74) and install on stator (93).

(5) Carefully insert the preassembled drive end cover-rotor group (72) [consists of items (76 through 84) which were preassembled in step 1 above]. Assemble gasket (62) and adapter (61). Attach to stator (93) with six seal washers (60) and six cap screws (59).

(6) Coat the eight rotor blades (73) completely with clean compressor lubricating oil and insert into rotor (77) slots from open end of stator (93).

(7) Apply a coating of clean compressor lubricating oil on o-rings (71 and 69). Install o-ring (71) on rotor shaft and assemble the

oil seal sleeve (70) on the shaft. Install o-ring (69) on sealing sleeve (68) and assemble sealing sleeve (68) over oil seal sleeve (70).

(8) Press oil seal (67) into bearing cover (65) with sealing lip of oil seal facing the oil seal sleeve (70). Assemble gasket (66) and bearing cover (65). Attach with six lock washers (64) and six cap screws (63).

(9) Assemble the inner grip springs (57), place coupling key (58) in shaft keyway, assemble drive coupling (56), outer grip springs (57), retainer (55), lock washer (54), and cap screw (53).

(10) If removed, install pipe plug (52) in intake end cover (49). Assemble bearing outer race (51) in end cover (49). Apply light coating of petroleum jelly on o-ring (50) and install o-ring (50) on the stator (93) end flange. Assemble end cover (49) to stator and attach with six seal washers (48), five cap screws (47) and one cap screw (46). Assemble retainer (45) to end of rotor shaft (84) with lock washer (44) and cap screw (43). Assemble gasket (42) and bearing cover (41) onto end cover (49) with six lock washers (40) and six cap screws (39).

(11) If removed, install two pipe plugs (38) in intake housing (32). Assemble steel ball (37), spring (36), o-ring (35), and plug (34) into housing (32). Apply a light coating of petroleum jelly ongasket (33) and assemble gasket (33) and intake housing (32) onto end cover (49). Attach with three lock washers (31) and three cap screws (30).

(12) If removed, install stop pin (29). Assemble shaft (28) in housing (32) and attach valve plate (27) to shaft (28) with two lock washers (26) and two screws (25).

(13) Assemble o-ring (23) and bushing (22) in bore of guide (20). Assemble gasket (21) and guide (20) onto housing (32) with two lock washers (19) and two cap screws (18). Insert push rod (24) in center hole of guide (20). Attach clamp (16) to guide (20) with cap screw (15) and lock nut (14). Pin (17) is used to attach speed control arm to clamp (16).

(14) Insert spring (12) into intake valve (13) and assemble valve (13) into housing (32). Assemble stem (9) through cylinder (10), assemble spring (8), piston (7), and attach together by assembling lock nut (6) on stem (9).

(15) Press breather (4) into cover (3). Apply a light coating of petroleum jelly on gasket (11) to hold in place against housing (32). Assemble gasket (11), cylinder (10), diaphragm (5), and cover (3). Attach to housing (32) with six lock washers (2) and six cap screws (1).

e. Installation. Install the air compressor assembly (para 5-11).

6-12. Air Compressor Rotor Blade Inspection and Replacement.

a. Disassembly.

(1) Remove the hose reel assembly (para 4-25).

(2) Remove the compressor access panel from the housing rear end panel.

(3) Unhook the speed control rod return spring. Remove the lock nut that secures speed control rod stop block to control lever arm and remove the stop block from the lever arm.

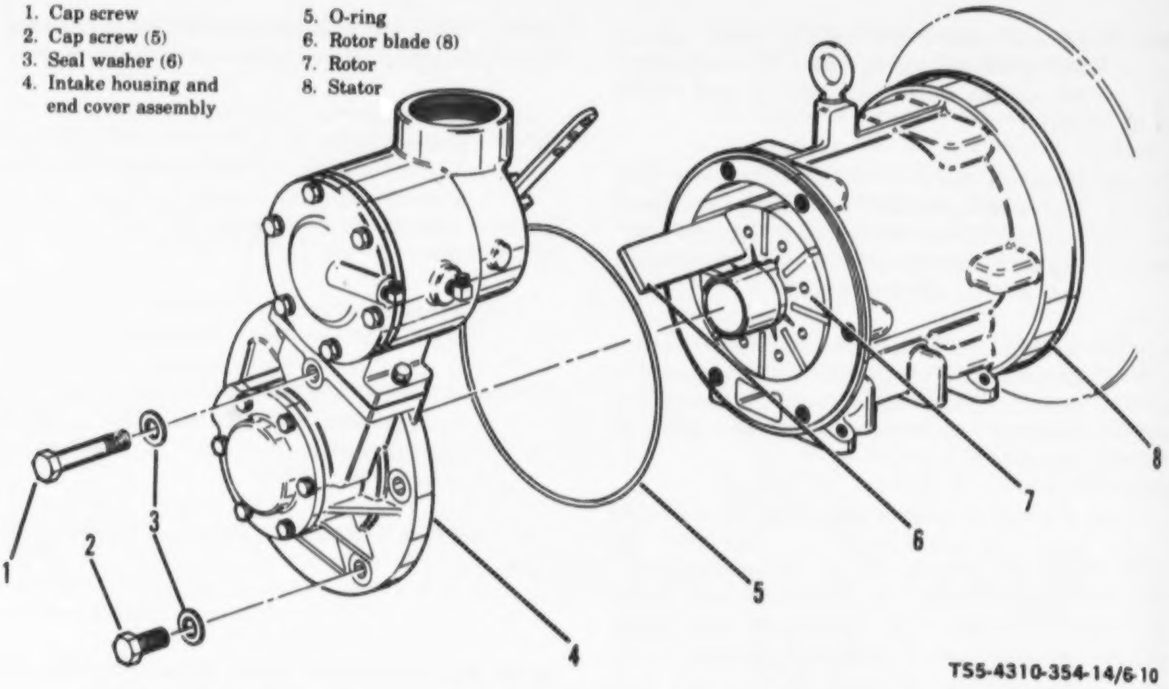
(4) Disconnect the compressor unloader control cable.

(5) Loosen hose clamp and remove compressor air intake flexible metal hose from the compressor.

(6) Disconnect hose assemblies from compressor intake control housing.

(7) Disassemble the compressor non-drive end in the numerical sequence shown in figure 6-10 as follows:

1. Cap screw
2. Cap screw (5)
3. Seal washer (6)
4. Intake housing and end cover assembly
5. O-ring
6. Rotor blade (8)
7. Rotor
8. Stator



TS5-4310-354-14/6-10

Figure 6-10. Compressor non-drive end, disassembly, blade inspection, and reassembly

(a) Remove one cap screw (1), five cap screws (2), and six seal washers (3). Tap intake housing and cover assembly (4) with a soft mallet while pulling away from stator (8). Remove the housing and cover assembly (4). Remove o-ring (5).

(b) Remove the eight rotor blades (6) from rotor (7) slots using a small wire with one end bent to form a hook. To remove the blades which are on the bottom of the rotor, press the start pushbutton on the instrument panel momentarily to rotate engine and compressor rotor to bring blades to a position where they can be removed.

b. Inspection. Inspect blades for evidence of excessive wear. See figure 6-11. Blades are excessively worn when 25 percent of covering, per side, has been worn off, and shiny metal is exposed. Blades worn on one side only can be turned around and reused. Replace blades that have been worn $^1/_{16}$-inch (1.59 mm) in height (figure 6-11). Replace blades worn on both sides, chipped, or damaged in any other way.

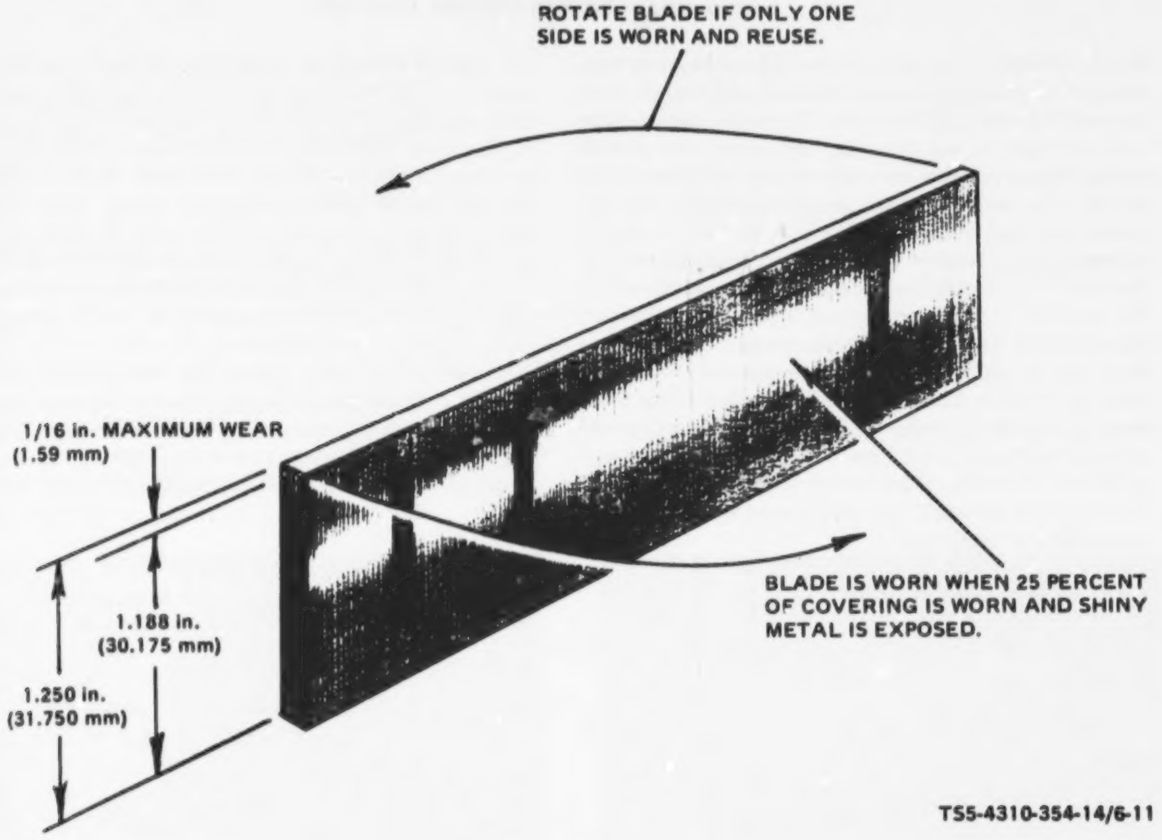

ROTATE BLADE IF ONLY ONE SIDE IS WORN AND REUSE.
1/16 in. MAXIMUM WEAR (1.59 mm)
1.188 in. (30.175 mm)
1.250 in. (31.750 mm)
BLADE IS WORN WHEN 25 PERCENT OF COVERING IS WORN AND SHINY METAL IS EXPOSED.
TS5-4310-354-14/6-11

Figure 6-11. Rotor blade inspection.

c. *Reassembly.*

(1) Reassemble the compressor non-drive end in the reverse numerical sequence shown in figure 6-10 as follows:

(a) Dip the eight rotor blades (6) and a new o-ring (5) in clean compressor oil before installing. Slide the blades (6) into the slots in rotor (7). Place o-ring (5) on end flange of stator (8).

(b) Carefully assemble the intake housing and end cover assembly (4) onto shaft bearing and against the face of stator (8). Attach with six seal washers (3), five cap screws (2), and one cap screw (1).

(2) Connect hose assemblies to intake control housing.

(3) Reassemble compressor air intake flexible metal hose on intake pipe and tighten hose clamp.

(4) Connect the compressor unloader control cable.

(5) Reassemble speed control rod stop block on control lever arm and secure with lock nut. Hook speed control rod return spring to stop block.

(6) Reassemble compressor access panel on housing rear end panel.

(7) Reassemble the hose reel assembly (para 4-25).

Section V. RADIATOR AND OIL COOLER

6-13. General. The radiator and oil cooler group consists of the engine coolant radiator and the air compressor lubricating oil cooler. These two components are attached to the housing end panel and the oil cooler is protected with a guard also attached to the panel. The assembly incorporates a fan shroud and guard on the radiator side. Cooling air is drawn through the oil cooler and radiator, passing over the finned tubes of each, by a suction type fan mounted on the engine. The engine coolant is circulated through the radiator and engine by the engine water pump and flow is regulated by a thermostat located in the engine cylinder head. Compressor lubricating oil is directed to the oil cooler by the action of the thermal bypass valve assembly located below the compressor oil filter. After the oil passes through the oil cooler, it flows to and through the compressor oil filter before entering the compressor.

6-14. Radiator and Oil Cooler.

a. Removal. Remove the radiator and oil cooler group from the unit (figure 4-18).

b. Disassembly. Disassemble the radiator and oil cooler group (figure 4-19).

c. Cleaning, Inspection, and Repair.

(1) Clean the exterior of the oil cooler assembly in accordance with paragraph 5-7*f*. Flush the interior of the cooler with the same type of solvent.

(2) Clean the radiator assembly in the same manner as described in step 1 above.

(3) Plug outlet connection of the oil cooler and fill with clean compressor oil (LO 5-4310-354-12, figure 3-1). Apply air pressure of from 4 to 10 PSI (0.28 to 0.70 KG/CM^2) to inlet connection and check for leaks. Mark each leak detected.

(4) Relieve the air pressure and drain oil from the cooler. Solder or braze all leaks detected and recheck by repeating step 3 above.

(5) Plug inlet and outlet connections of the radiator and fill with water. Apply air pressure of from 4 to 10 PSI (0.28 to 0.70 KG/CM^2) to the radiator filler opening and check radiator for leaks. Mark each leak detected.

(6) Relieve the air pressure and drain water from the radiator. Solder or braze all leaks detected and recheck by repeating step 5 above.

(7) Inspect all attaching hardware for cracks, breaks, damaged threads, or any other defect.

d. Reassembly. Reassemble the radiator and oil cooler group (figure 4-19).

e. Installation. Install the radiator and oil cooler group on the unit (figure 4-18).

Section VI. FUEL TANK

6-15. General. The fuel tank is located on the unit frame mounted below the radiator and oil cooler group. The tank has a capacity of 19 gallons (71.9 liters) and incorporates an electrically operated fuel level sending unit. The sending unit is of the float type which sends an electrical impulse to the fuel level gauge located on the instrument panel where the level of fuel remaining in the tank is read. Fuel is drawn from the tank by the engine transfer pump and then flows to the fuel injection pump. The fuel injection pump meters the correct amount of fuel required for each cylinder and pumps this fuel to each fuel injection nozzle in the proper firing order. More fuel than is necessary for engine operation passes through the fuel injection pump for lubrication and cooling of the pump. This excess fuel flows back to the fuel tank. See figure 5-3.

6-16. Fuel Tank.

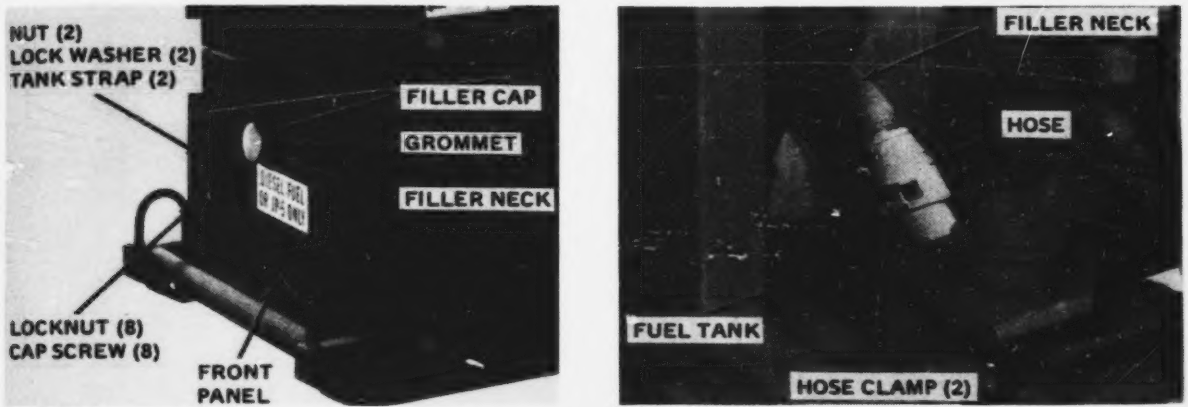
a. Removal.

(1) Disconnect the two wire assemblies from fuel level sending unit.

(2) Disconnect the fuel pickup and return hose assemblies from the tank.

(3) Remove fuel tank drain plug and drain fuel from tank. Install drain plug.

(4) Remove the fuel tank as shown in figure 6-12.



REMOVAL

INSTALLATION

TS5-4310-354-14/6-12

STEP 1. REMOVE THE FUEL TANK FILLER CAP. LOOSEN HOSE CLAMPS AND REMOVE FUEL FILLER NECK AND CONNECTING HOSE WITH CLAMPS.

STEP 2. REMOVE NUTS AND LOCK WASHERS THAT SECURE FUEL TANK STRAPS TO FRAME FRONT PANEL.

STEP 3. REMOVE LOCKNUTS AND CAP SCREWS THAT ATTACH FRONT PANEL TO FRAME. REMOVE THE FRONT PANEL.

STEP 4. REMOVE THE FUEL TANK. WHEN NECESSARY, REMOVE NUTS, LOCK WASHERS, CAP SCREWS, AND FUEL TANK STRAPS WITH WEBBING.

STEP 1. AS NECESSARY, USE A SUITABLE GLUE TO ATTACH WEBBING TO FUEL TANK STRAPS. INSTALL FUEL TANK STRAPS AND ATTACH TO FRAME WITH CAP SCREWS, LOCK WASHERS, AND NUTS.

STEP 2. INSTALL FUEL TANK IN POSITION. INSTALL FRONT PANEL AND ATTACH TO FRAME WITH CAP SCREWS AND LOCK NUTS.

STEP 3. INSTALL FUEL TANK FILLER NECK THROUGH GROMMET IN FRONT PANEL AND INSTALL HOSE CONNECTION ON TANK AND FILLER NECK. TIGHTEN THE HOSE CLAMPS.

STEP 4. INSTALL LOCK WASHERS AND NUTS ON STUD ENDS OF FUEL TANK STRAPS AND SECURE TANK FIRMLY TO FRAME BY TIGHTENING THE NUTS ON TANK STRAPS. INSTALL THE FUEL TANK FILLER CAP.

Figure 6-12. Fuel tank, removal and installation.

b. Cleaning, Inspection, and Repair.

(1) Clean the exterior of the tank in accordance with paragraph 5-7*f*. Flush the inside of the tank with the same type of solvent. Dry thoroughly.

(2) Inspect tank end seams for any leakage. Check tank for any holes and distortion, or any other damage.

(3) Check the fuel level sending unit for proper operation.

(4) Inspect attaching hardware for cracks, breaks, damaged threads, or any other defect.

c. Testing. Using an ohmmeter, connect test lead to fuel level sending unit terminal. Move the float from its down (empty) position to up (full) position. Ohmmeter reading should be from zero ohms at down position to 90 ohms in up position to indicate proper function of fuel level sending unit.

d. Installation.

(1) Install the fuel tank on the unit as shown in figure 6-12.

(2) Connect the fuel pickup and return hose assemblies to the tank.

(3) Connect wire assemblies to fuel level sending unit (figure 1-3).

(4) Fill the fuel tank with proper grade of fuel. Purge air from fuel system (figure 3-17).

CHAPTER 7

REPAIR OF ENGINE ASSEMBLY

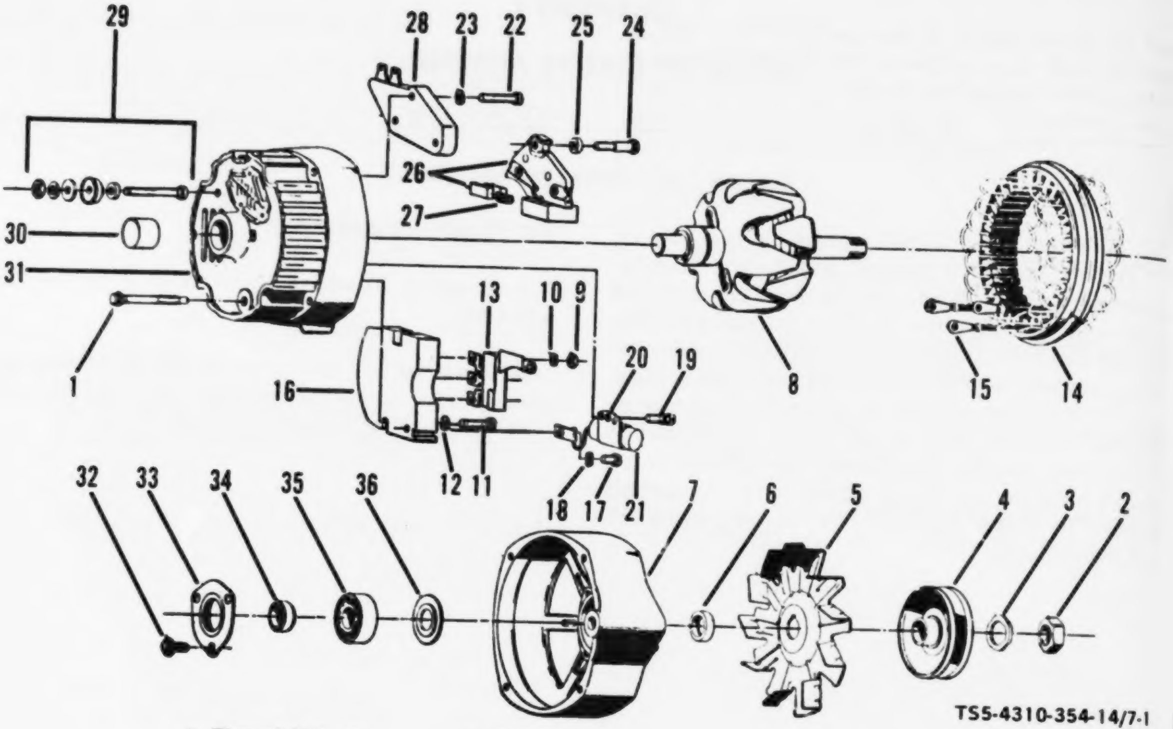
Section I. ALTERNATOR ASSEMBLY

7-1. General. The alternator assembly is a 12-volt, 37 ampere, negative ground, belt-driven, electric-generating device. When the engine is running, the alternator provides the current for charging the battery and operating the unit electrical accessories. This alternator assembly features a solid state regulator built-in that requires no adjusting of the voltage setting. The rotor bearings are prelubricated and do not require periodic lubrication. The alternator assembly is driven by a V-belt off the engine crankshaft pulley. The V-belt also drives the engine cooling fan and water pump.

7-2. Alternator Assembly.

a. Removal. Remove the alternator assembly (figure 4-25).

b. Disassembly. Disassemble the alternator assembly in the numerical sequence shown in figure 7-1 and the following detailed instructions.



TS5-4310-354-14/7-1

1. Through bolts (4)
2. Shaft nut
3. Lock washer
4. Pulley
5. Fan
6. Outside collar
7. Drive end frame
8. Rotor assembly
9. Nut (3)
10. Lock washer (3)
11. Screw
12. Lock washer
13. Diode trio
14. Stator assembly
15. Stator lead clip (2)
16. Rectifier bridge
17. Screw
18. Lock washer
19. Screw and lock washer
20. Capacitor bracket
21. Capacitor
22. Screw (2)
23. Lock washer (2)
24. Insulated screw
25. Insulator
26. Brush and holder
27. Brush spring
28. Regulator
29. Terminal package
30. Bearing
31. Slip ring end frame
32. Screw (3)
33. Retainer
34. Inside collar
35. Bearing
36. Grease slinger

Figure 7-1. Alternator assembly, disassembly and reassembly.

(1) Scribe a mark for reassembly location on slip ring end frame (31) and drive end frame (7). Remove the four through bolts (1) and using a screwdriver at the stator slots separate the drive end frame (7) and rotor assembly (8) from the stator assembly (14).

CAUTION

Do not use a tape that will leave a gummy deposit on bearing or rotor shaft.

(2) After separating end frames (31, 7), place a piece of tape over slip ring end frame bearing and rotor shaft on the slip ring end of rotor assembly (8) to prevent shaft damage and dirt from entering bearing.

CAUTION

Do not overtighten vise when holding rotor assembly (8) for shaft nut (2) removal.

(3) Place rotor assembly (8) in a vise and tighten only enough to remove shaft nut (2). Remove the nut (2), lock washer (3), pulley (4), fan (5), and outside collar (6) from rotor (8) shaft. Separate rotor assembly (8) from drive end frame (7).

NOTE

Refer to paragraph 7-2.*c* below for component testing.

(4) Remove three nuts (9), three lock washers (10), screw (11), lock washers (12), and diode trio (13). Remove stator assembly (14). Do not remove stator lead clips (15) except for replacement.

(5) Remove rectifier bridge (16), screw (17), lock washer (18), screw and lock washer (19), capacitor bracket (20), and capacitor (21).

(6) Remove two screws (22), lock washers (23), insulated screw (24), insulator (25), brush and holder (26), brush spring (27), and regulator (28).

(7) Only as necessary, remove the terminal package (29) and bearing (30) from slip ring end frame (31).

(8) Remove three screws (32), retainer (33), inside collar (34), bearing (35), and grease slinger (36) from drive end frame (7).

c. Component Testing. Test the alternator components as described below.

(*1*) *Rotor field winding checks.* To check for opens, connect an ohmmeter to each slip ring as shown in figure 7-2. If the ohmmeter reading is high (infinite), the winding is open. Connect the ohmmeter from one slip ring to shaft. If reading is low, the rotor winding is grounded. The winding is checked for short circuits or excessive resistance by connecting a 12-volt battery and ammeter in series with the edges of the two slip rings. Specified field current at 80°F (26.7°C) is 4.0-4.5 amps. An ammeter reading above the specified value indicates shorted windings; a reading below specified value indicates excessive resistance.

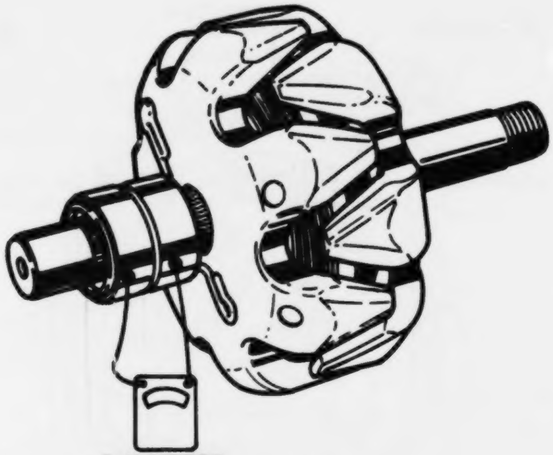


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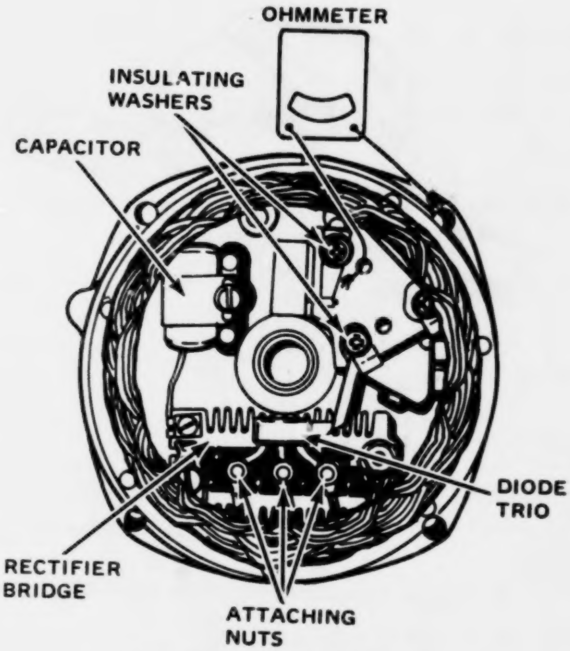
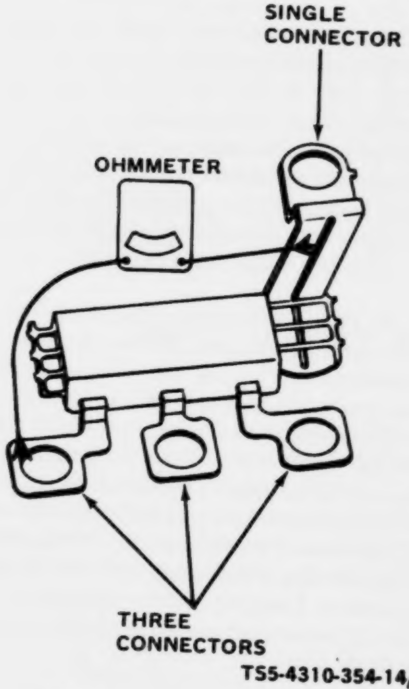
Figure 7-2. Checking rotor winding.

An alternate method is to check the resistance of the field by connecting an ohmmeter to the two slip rings (figure 7-2). If the resistance reading is below specified value, the winding is shorted; if above specified value, the winding has excessive resistance. The specified resistance value is determined by dividing the voltage by the specified current. The winding resistance and ammeter readings will vary slightly with winding temperature changes.

(*2*) *Diode trio check.* The diode trio is checked while removed from end frame assembly. Connect an ohmmeter having a 1½-volt cell, and using the lowest range scale, to the single connector and to one of the three connectors as shown in figure 7-3. Observe the reading. Then, reverse the ohmmeter leads to the same two connectors. If both readings are the same, replace the diode trio. A good diode trio will give one high and one low reading. Repeat this same test between the single connector and each of the other two connectors. Also, connect the ohmmeter to each pair of the three connectors. If any reading is zero, replace the diode trio.



A INSIDE VIEW OF END FRAME ASSEMBLY FOR IDENTIFICATION



TS5-4310-354-14/7-3

B DIODE TRIO CHECK

Figure 7-3. Diode trio check

(3) *Rectifier bridge check.* The rectifier bridge has a grounded heat sink and an insulated heat sink connected to the output terminal. An insulating washer is located between the insulated heat sink and end frame. To check rectifier bridge, connect an ohmmeter to the grounded heat sink and one of the three terminals as shown in A, figure 7-4. IMPORTANT: If rectifier bridge is constructed as shown in B, figure 7-4, connect ohmmeter pressing down very firmly onto flat metal connector, and not onto threaded stud as shown in A, figure 7-4. Then, reverse the lead connections to the grounded heat sink and the same terminal. If both readings are the same, replace the rectifier bridge. A good rectivier bridge will give one high and one low reading. Repeat this same test between the grounded heat sink and the other two terminals, and between the insulated heat sink and each of the three terminals. This makes a total of six checks, with two readings taken for each check. The ohmmeter check of the rectifier bridge, and of the diode trio descripted in step 2 above, is a valid and accurate check. DO NOT replace either unit unless at least one pair of readings is the same. Rectifier bridges may vary in appearance but are completely interchangeable.

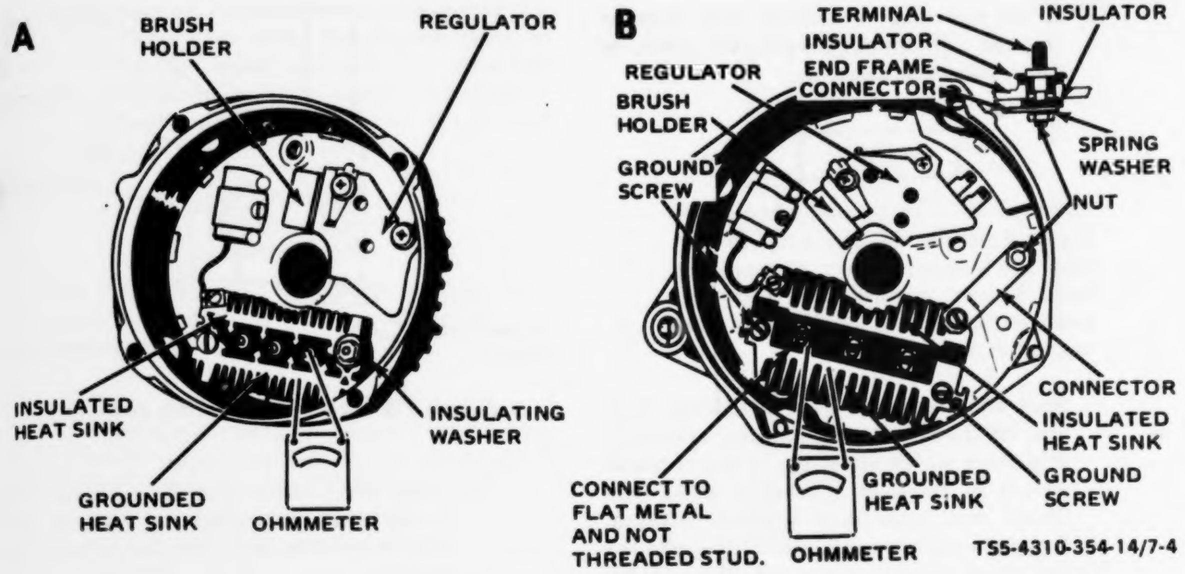

A
BRUSH HOLDER
REGULATOR
INSULATED HEAT SINK
INSULATING WASHER
GROUNDED HEAT SINK
OHMMETER
B
TERMINAL
INSULATOR
INSULATOR
END FRAME
CONNECTOR
REGULATOR
BRUSH HOLDER
GROUND SCREW
SPRING WASHER
NUT
CONNECTOR
INSULATED HEAT SINK
GROUND SCREW
GROUNDED HEAT SINK
CONNECT TO FLAT METAL AND NOT THREADED STUD.
OHMMETER
TS5-4310-354-14/7-4

Figure 7-4. Rectifier bridge check.

(4) *Stator check.* Check the stator for opens and grounds using an ohmmeter as shown in figure 7-5. If the reading is low when connected from any stator lead to the frame, the windings are grounded. If the meter reading is high when successively connected between each pair of stator leads, the windings are open. A short circuit in the stator windings is difficult to locate without laboratory test equipment due to the low resistance of the windings. However, if all electrical checks are normal and the alternator fails to supply rated output, shorted stator windings are indicated. Check the regulator in the next step before replacing the stator.

(5) *Regulator testing.* To determine if the regulator is defective, use an approved regulator tester.

d. Cleaning, Inspection, and Repair.

CAUTION

Do not use solvent to soak or clean any insulation or electrical component.

(1) Clean internal parts with clean, dry compressed air.

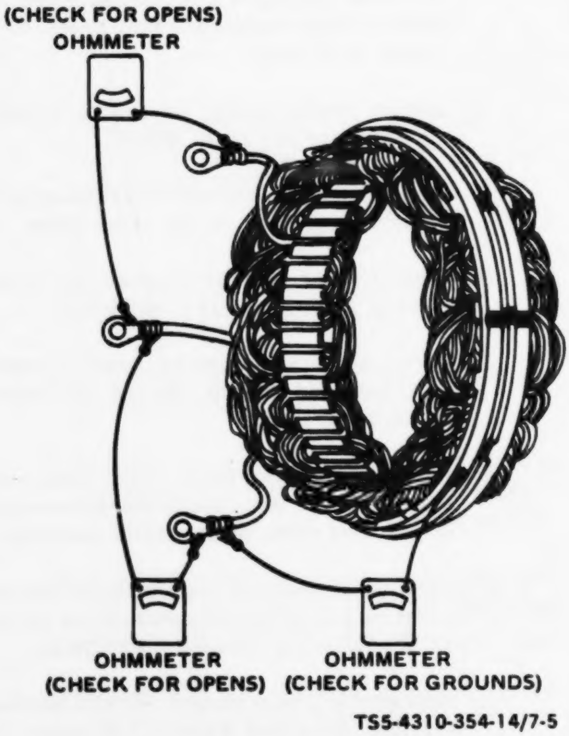

(CHECK FOR OPENS) OHMMETER
OHMMETER (CHECK FOR OPENS)
OHMMETER (CHECK FOR GROUNDS)
TS5-4310-354-14/7-5

Figure 7-5. Checking stator windings.

(2) If the slip rings are dirty, they may be cleaned and finished with 400 grain, or finer, polishing cloth.

CAUTION

The rotor must be rotated when cleaning or finishing the slip rings so that they are cleaned evenly. Cleaning by hand without spinning the rotor may result in flat spots on the slip rings causing brush noise.

Spin the rotor and hold polishing cloth against the slip rings until they are clean. Slip rings which are rough or out of round should be trued in a lathe to 0.002 inch (0.051 mm) maximum indicator reading. Remove only enough material to make the slip rings smooth and round. Then, finish with 400 grain, or finer, polishing cloth. Blow away all polishing dust with clean, dry compressed air.

(3) Inspect brushes for cracks, chips, and excessive wear. Replace the brush and holder assembly when brushes are worn to less than ¼-inch (6.35 mm).

(4) Inspect brush springs for cracks, breaks, distortion, or any other defect.

(5) Inspect bearings for freedom of rotation, any gritty action, wear, or any other defect.

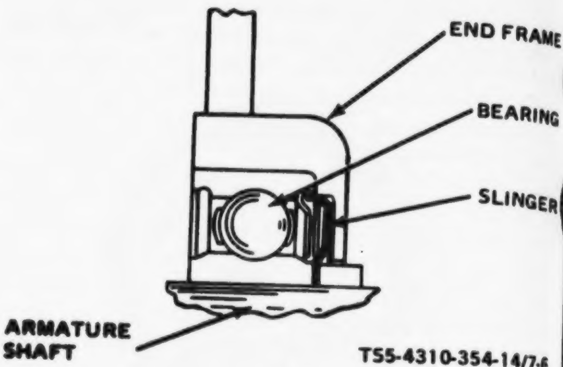
(6) Inspect rotor bearing journals for wear, scoring, pitting, or any other defect.

(7) Check all parts for cracks, breaks, distortion, damaged threads, burned insulation, or any other defects.

(8) Repair of the alternator, other than that detailed above, is limited to the replacement of defective parts, or the entire assembly.

e. Reassembly. Reassemble the alternator assembly in the reverse numerical sequence shown in figure 7-1 and the following detailed instructions.

(1) Reassemble grease slinger (36) and bearing (35) into drive end frame (7) as shown in figure 7-6. Press bearing in with a tube or collar that just fits over the outer race. Fill cavity between bearing and retainer plate with lubricant equal to Delco-Remy No. 1948791.



TS5-4310-354-14/7-6

Figure 7-6. Drive end bearing assembly.

(2) Reassemble inside collar (34, figure 7-1) and a new retainer plate (33) if the felt seal is hardened, worn, or otherwise defective. Attach with three screws (32).

NOTE

At reassembly refer to figures 7-3 and 7-4, as well as figure 7-1, for reassembly order of parts.

(3) Reassemble a new bearing (30) in slip ring end frame (31) using a flat plate over the bearing and press in from the outside toward the inside of the frame until bearing is flush with outside of end frame. Support the inside of the end frame with a hollow cylinder to prevent breakage of the frame. Use care to avoid misalignment of bearing. Reassemble terminal package (29), refer to figure 7-4, for order of parts.

(4) Reassemble regulator (28, figure 7-1), brush spring (27), brush and holder (26), insulator (25), insulated screw (24), two lock washers (23) and two screws (22).

(5) Reassemble capacitor (21) into capacitor bracket (20); attach with screw and lock washer (19), lock washer (18), and screw (17).

(6) If removed, reassemble stator lead clips (15) to stator (14) leads. Reassemble rectifier bridge (16), stator assembly (14), diode trio (13), lock washer (12), screw (11), make lead connections and assemble three lock washers (10) and nuts (9).

CAUTION

Do not overtighten vise when holding rotor assembly (8) for reassembly of items (7 through 2).

(7) Place rotor assembly (8) in a vise and tighten just enough to keep it from turning when tightening nut (2). Assemble drive end frame (7), outside collar (6), fan (5), pulley (4), lock washer (3), and nut (2). Tighten nut (2) to 40-60 foot-pounds (5.5-8.3 kg-meters).

(8) Remove rotor assembly from vise and remove protective tape installed at disassembly. Make certain that rotor shaft and bearing are clean. Insert a pin through hole in slip ring end frame (31) to hold up the brushes. Carefully assemble the end frame (31) onto rotor assembly shaft aligning the scribe marks made at disassembly. Install the through bolts (1) and remove the brush retaining pin to allow brushes to drop onto slip rings.

f. Bench Testing. To bench test the alternator assembly before installing on engine, make setup in a test stand and test as follows:

(1) Make connections as shown in figure 7-7, except do not connect carbon pile at this time. IMPORTANT: Ground polarity of battery and alternator must be the same — negative. Use a fully charged battery and a 10-ohm resistor rated at six watts or more between alternator No. 1 terminal and the battery.

(2) Start the test stand and slowly increase the alternator speed and observe the voltage.

(3) If the voltage is uncontrolled with speed and increases above 15.5 volts, check for a grounded brush lead clip. Refer to troubleshooting table 5-1 under heading of Overcharged Battery. If not grounded, test regulator with an approved regulator testor, and check field winding.

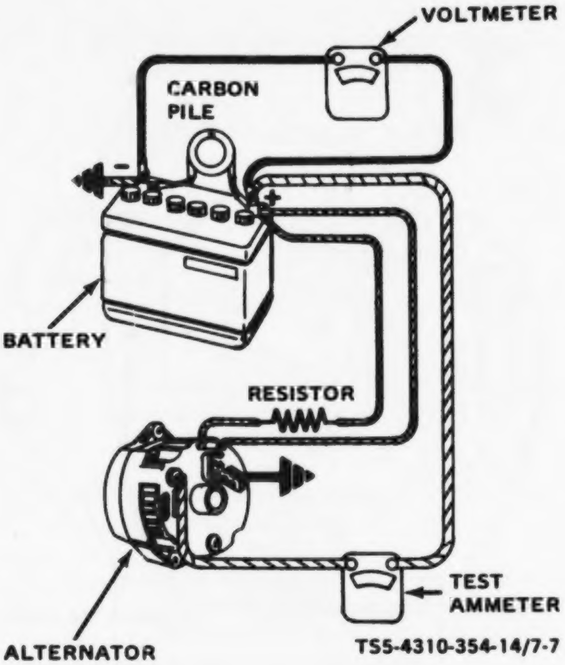


Figure 7-7. Alternator bench testing.

NOTE

The battery MUST be fully charged when making this check.

(4) If voltage is below 15.5 volts, connect the carbon pile as shown in figure 7-7.

(5) Operate the alternator at moderate speed as required and adjust the carbon pile as required to obtain maximum current output.

(6) If output is within 10 amperes of rated output of 37 amperes (stamped on drive end frame), the alternator is good.

(7) If output is not within 10 amperes of rated output, keep battery loaded with carbon pile and ground the alternator field as shown in figure 7-8.

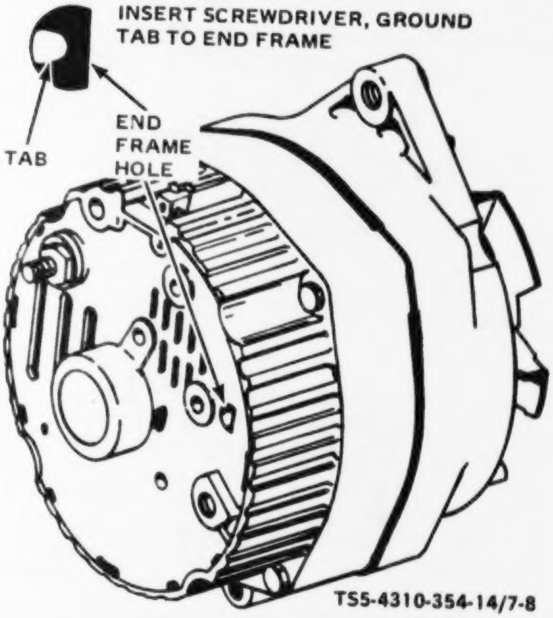


Figure 7-8. Grounding alternator field winding.

(8) Operate alternator at moderate speed and adjust carbon pile as required to obtain maximum output.

(9) If output is within 10 amperes of rated output, test regulator with an approved regulator tester, and check field winding.

(10) If output is not within 10 amperes of rated output, check the field winding, diode trio, rectifier bridge, and stator as outlined in paragraph 7-2.*c*.

g. Installation. Install the alternator assembly (figure 4-25).

Section II. STARTING MOTOR ASSEMBLY

7-3. General. The starting motor assembly converts electrical energy from the battery into mechanical energy to crank the engine for starting. A solenoid is mounted on the outside of the frame with the solenoid plunger and pinion shaft mechanism totally enclosed. The drive assembly is an overrunning clutch type which assures complete drive engagement before the motor begins to rotate. When the engine starts, the clutch releases and allows the pinion to turn faster than the armature shaft until the start switch is released and the return spring action retracts the pinion from the flywheel ring gear.

7-4. Starting Motor Assembly.

a. Removal. Remove the starting motor assembly (figure 4-24).

NOTE

Before disassembly, the starting motor assembly should be tested to determine the extent of disassembly necessary and possible defects to look for at disassembly.

b. Testing Before Disassembly. Check the pinion for freedom of operation by turning it on the screw shaft. Check armature for freedom of rotation by prying the pinion with a screwdriver. Tight bearings, a bent armature shaft, or a loose pole shoe screw will cause the armature to bind. If the armature does not turn freely, the starting motor should be disassembled and inspected. If the armature does rotate freely, the starting motor assembly should be given a no-load test before disassembly as follows:

(1) Make a no-load test setup as shown in figure 7-9. Use a fully charged 12-volt battery and a switch in open position at setup.

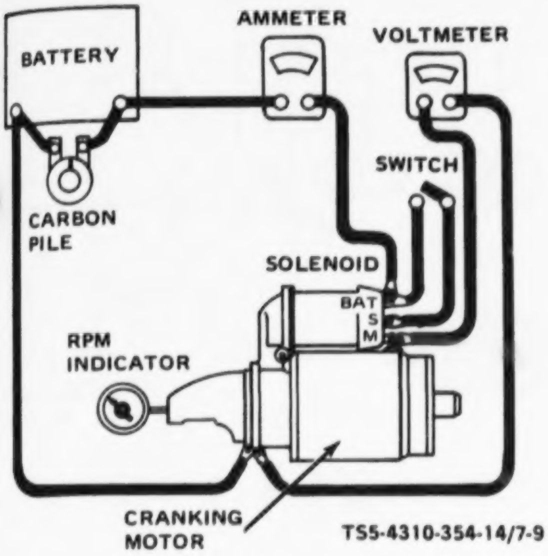


Figure 7-9. Starting motor assembly, no-load test setup.

(2) Close the switch and note the rpm, current, and voltage readings. These should be 8000-13000 rpm, 40-140 amperes, 9 volts. It is not necessary to obtain exactly 9 volts, as an accurate interpretation can be made by recognizing that if the voltage is slightly higher, the rpm will be proportionately higher, with current remaining essentially unchanged.

(3) If the exact voltage is desired, a carbon pile connection across the battery can be used to reduce the voltage to the specified value.

(4) Make disconnections only with the switch open. Interpret the test results as follows:

(a) Rated current draw and no-load speed indicate normal condition of motor.

(b) Low free speed and high current draw indicate:

1. Too much friction-tight, dirty, or worn bearings, bent armature shaft or loose pole shoes allowing armature to drag.

2. Shorted armature. This can be further checked on a growler after disassembly.

3. Grounded armature or fields. Check further after disassembly.

(c) Failure to operate with high current draw indicates:

1. A direct ground in the terminal or fields.

2. Siezed bearings (this should have been determined by turning the armature by hand).

(d) Failure to operate with no current draw indicates:

1. Open field circuit. This can be further checked after disassembly by inspecting internal connections and tracing circuit with a test lamp.

2. Open armature coils. Inspect the commutator for badly burned bars after disassembly.

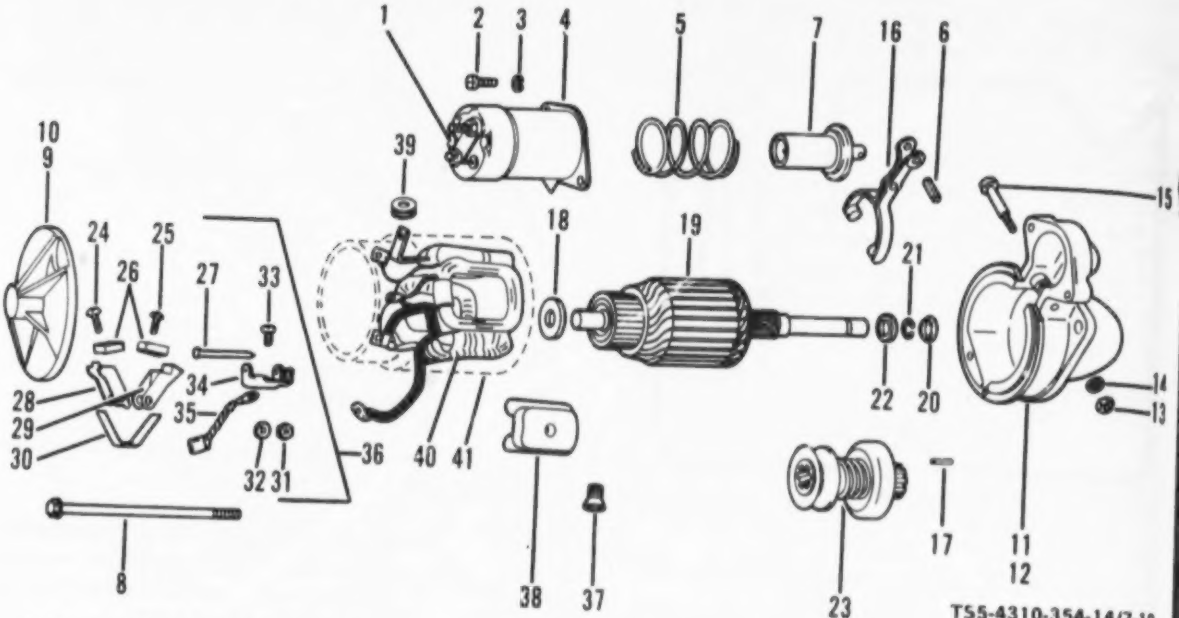
3. Broken brush springs, worn brushes, high insulation between commutator bars or other causes which would prevent good contact between the brushes and commutator.

(e) Low no-load speed and low current draw indicate:

1. High internal resistance due to poor connections, defective leads, dirty commutator and causes listed under (d) above.

(f) High free speed and high current draw indicate shorted fields. If shorted fields are suspected, replace the field coil assembly and check for improved performance.

c. *Disassembly.* Disassemble the starting motor assembly in the numerical sequence shown in figure 7-10 and the following detailed instructions.



TS5-4310-354-14/7-10

1. Screw and lock washer
2. Screw (2)
3. Lock washer (2)
4. Solenoid switch
5. Plunger spring
6. Lever pin
7. Plunger
8. Through bolt (2)
9. Commutator end frame
10. Frame bushing
11. Drive housing
12. Drive housing bushing
13. Nut
14. Lock washer
15. Lever stud
16. Shift lever
17. Dowel pin
18. Washer
19. Armature
20. Thrust collar
21. Retaining ring
22. Retainer
23. Clutch and drive assy
24. Ground brush screw (2)
25. Insulating brush screw (2)
26. Brush (4)
27. Brush holder pin (2)
28. Ground brush holder (2)
29. Insulating brush holder (2)
30. Brush spring (2)
31. Nut (4)
32. Lock washer (4)
33. Screw (4)
34. Brush holder support (2)
35. Ground lead (2)
36. Support package (2)
37. Pole shoe screw (4)
38. Pole shoe (4)
39. Grommet
40. Field coil assembly
41. Frame

Figure 7-10. Starting motor assembly, disassembly and reassembly.

(1) Remove screw and lock washer (1), two screws (2), two lock washers (3), and solenoid switch (4). Remove the plunger spring (5), lever pin (6), and plunger (7).

(2) Remove the two through bolts (8). Remove commutator end frame (9). Do not remove frame bushing (10) unless replacement is necessary. Remove drive housing (11) from starter frame (41). Do not remove drive housing bushing (12) unless replacement is necessary.

(3) Disassemble nut (13), lock washer (14), lever stud (15), and shift lever (16) from housing (11). Remove dowel pin (17) only as necessary.

(4) Remove washer (18) from armature (19) shaft and remove the armature (19). Remove thrust collar (20).

(5) To remove retaining ring (21), retainer (22), and the clutch and drive assembly (23), slide a metal cylinder onto shaft, strike the cylinder with a hammer driving the retainer toward the armature core and off the retaining ring as shown in figure 7-11. Remove the retaining ring from the groove in the armature shaft, remove the retainer and clutch and drive assembly.

NOTE

The clutch and drive assembly is serviced as an assembly. Do not attempt to disassemble.

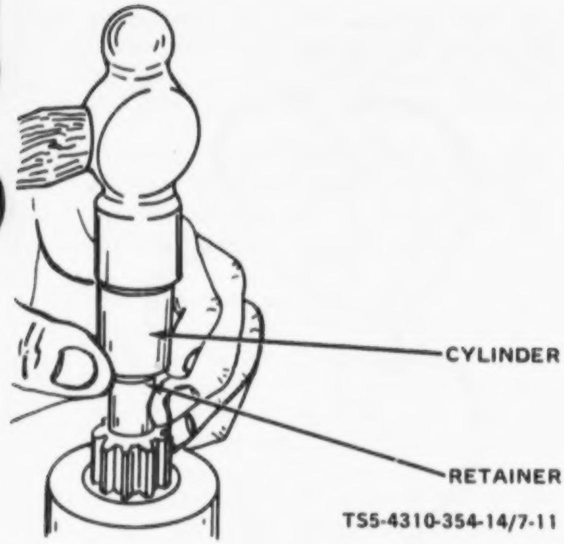


Figure 7-11. Removing retainer from snap ring.

(6) Remove two ground brush screws (24, figure 7-10), two insulating brush screws (25), and the four brushes (26). Remove the two brush holder pins (27), the two ground brush holders (28), and two insulating brush holders (29). Remove two brush springs (30).

(7) Only when necessary to disassemble support packages (36), remove four nuts (31), lock washers (32), and screws (33). Remove two brush holder supports (34) and two ground leads (35).

(8) Remove four pole shoe screws (37) from starter frame (41) to remove the four pole shoes (38). Remove grommet (39) and, only as needed, field coil assembly (40) from starter frame (41).

d. Cleaning, Inspection, and Repair.

CAUTION

Do not soak or clean any insulating or electrical components such as brushes, coils, and armature with solvent. Do not clean overrunning clutch and drive assembly with solvent as this will dissolve clutch mechanism lubricant.

(1) Clean housings and end frames in accordance with paragraph 5-7*f*.

(2) Clean internal parts with clean, dry compressed air.

(3) Inspect brushes for cracks, chips, excessive wear, or any other defect.

(4) Inspect bearings for wear, scoring, pitting, or any other defect.

(5) Inspect brush springs and arms for cracks, breaks, distortion, or any other defect.

(6) Inspect commutator for rough spots, discoloration, pitting, scoring, and high mica. If commutator is rough, pitted, or worn, turn commutator using a lathe. Take light cuts until all pits are removed. Remove all burrs by holding No. 00 sandpaper lightly against commutator while armature is turning in lathe. Undercut mica after turning commutator. The mica must be undercut to a depth of $^{1}/_{32}$-inch and width of $^{1}/_{32}$-inch (0.79 by 0.79 mm).

(7) Inspect commutator for out-of-round using a dial indicator. Out-of-round shall not exceed 0.001 inch total indicator reading.

(8) Inspect armature shaft for pitting, scoring, or excessive wear. Inspect drive assembly for broken teeth on pinion. Check to make certain that clutch assembly moves on shaft properly. Slide drive assembly on armature shaft to make certain that splines fit properly.

(9) Inspect solenoid parts. Check condition of moving core. Check contact assembly and terminal studs for evidence of burning, corrosion, or excessive pitting.

(10) Inspect all other parts for cracks, breaks, excessive wear, damaged insulation, or any other defect.

(11) Inspect all attaching hardware for damaged threads, cracks, or any other defect.

e. Component Testing.

(*1*) *Armature.* Check the armature for short circuits, opens, and grounds as follows:

(a) Short circuits are located by rotating the armature in a growler with a steel strip, such as a hacksaw blade, held on the armature. The steel strip will vibrate on the area of short circuit. Shorts between bars are sometimes produced by brush dust or copper between the bars. Undercutting the insulation will eliminate these shorts.

(b) Opens may be located by inspecting the points where the conductors are joined to the commutator for loose connections. Poor connections cause arcing and burning of the commutator. If the bars are not badly burned, leads originally soldered to the riser bars can be resoldered.

(c) Grounds in the armature can be detected by the use of a test lamp. If the lamp lights when one test prod is placed on the commutator and the other test prod on the armature core or shaft, the armature is grounded. If the commutator is worn, dirty, out of round, or has high insulation, the commutator should be turned down and undercut.

(2) *Field Coils.* Check the field coils for grounds and opens using a test lamp.

(a) *Grounds.* Disconnect field coil ground connections. Connect one test prod to the field frame and the other to the field connector. If the test lamp lights, the field coils are gounded and must be repaired or replaced. (This check cannot be made if the ground connection cannot be disconnected.)

(b) *Opens.* Connect test lamp prods to ends of field coils. If lamp does not light, the field coils are open.

(3) *Solenoid.* Make a solenoid test setup as shown in figure 7-12. Use a 12-volt battery and all leads disconnected from solenoid. To check hold-in winding, make test connections to the solenoid switch (S) terminal and to ground (G). Use the carbon pile across the battery to decrease voltage to 10 volts. Observe ammeter reading. It should be 14.5-16.5 amperes. A high reading indicates a shorted or grounded hold-in winding. A low reading indicates excessive resistance. To check the pull-in winding, connect from the solenoid switch terminal(s), and to the solenoid motor (M) terminal.

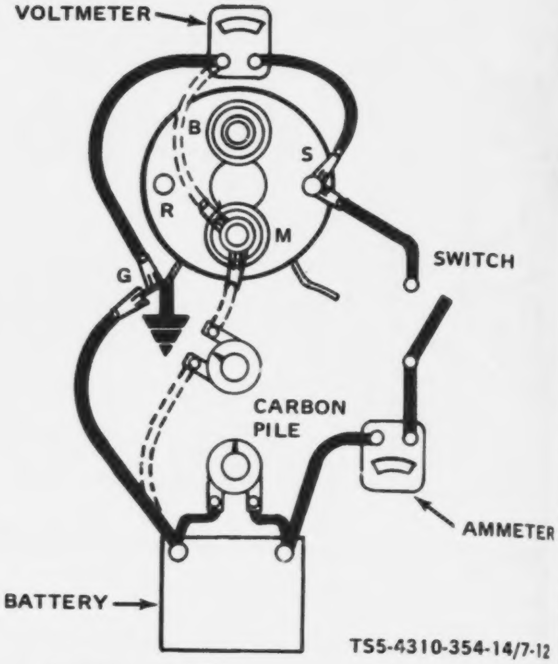


Figure 7-12. Solenoid checking test setup.

NOTE

Connect the carbon pile between the battery and M terminal as shown in dashed lines on figure 7-12, instead of across the battery, if needed, to reduce voltage to 5 volts for pull-in check. If not needed, connect a jumper directly from battery to the M terminal. At 5 volts, ampere reading should be 13-15.5 amps.

CAUTION

To prevent overheating, do not leave the pull-in winding energized more than 15 seconds. The current draw will decrease as the winding temperature increases.

f. Reassembly. Reassemble the starting motor assembly in the reverse numerical sequence shown in figure 7-10 and the specific details which follow.

(1) Reassemble field coil assembly (40) into starter frame (41), assemble grommet (39), four pole shoes (38), and attach with four pole shoe screws (37).

(2) If the two support packages (36) were disassembled, reassemble two ground leads (35), brush holder supports (34), screws (33), lock washers (32), and nuts (31).

(3) Reassemble two brush springs (30), two insulating brush holders (29), two ground brush holders (28), attach with brush holder pins (27). Reassemble four brushes (26), two insulating brush screws (25), and two ground brush screws (24).

(4) Place clutch and drive assembly (23) on armature (19) shaft. Place retainer (22) on shaft with cupped surface facing the retaining ring groove on shaft. Place the retaining ring (21) on the end of the armature shaft. Using a piece of wood, force the retaining ring over the shaft with a light hammer blow as shown in figure 7-13. Then, slide the retaining ring into the groove.

(5) Force the retainer over the retaining ring by placing a suitable washer over the shaft and squeeze retainer and washer together with pliers as shown in figure 7-13. Remove the washer. Lubricate the armature (19) shaft and spline with Delco-Remy Lubricant No. 1960954, or equivalent.

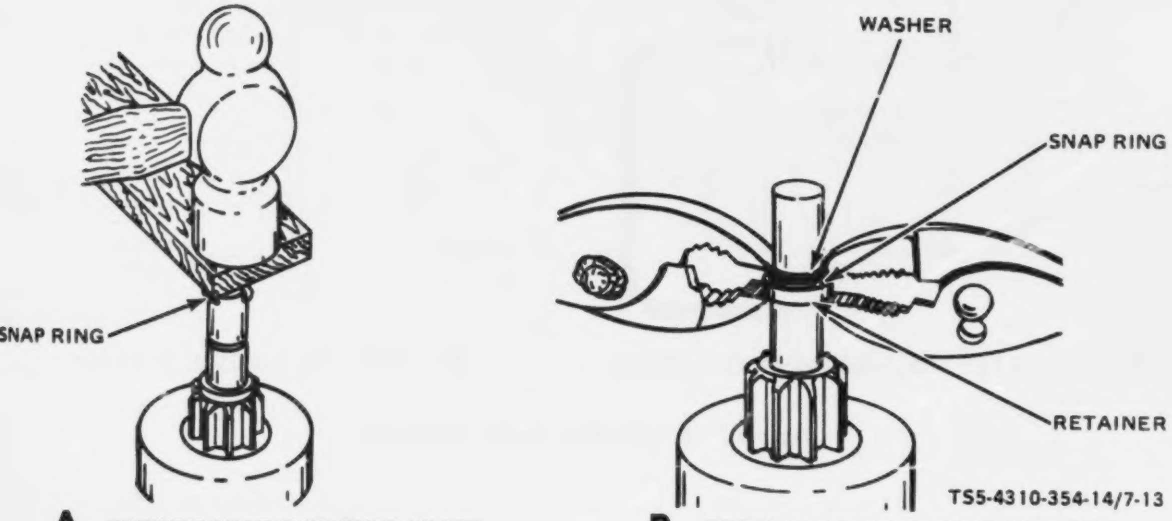
(6) Reassemble armature (19) into starter frame (41) and place washer (18) on armature shaft.

(7) If disassembled, reassemble dowel pin (17), bushing (12) into housing (11) and bushing (10) into end frame (9). Lubricate bushings (12, 10) with Delco-Remy Lubricant No. 1960954, or equivalent.

(8) Reassemble shift lever (16), lever stud (15), lock washer (14), and nut (13) in drive housing (11). Assemble drive housing (11) to starter frame (41) with shift lever (16) engaged with groove of clutch and drive assembly (23).

(9) Reassemble commutator end frame (9) on starter frame and install two through bolts (8).

(10) Reassemble plunger (7) to shift lever (16) with lever pin (6). Assemble spring (5) and solenoid switch (4) over plunger and attach solenoid switch (4) flange to drive housing



A FORCING SNAP RING OVER SHAFT

B FORCING RETAINER OVER SNAP RING

Figure 7-13. Installing clutch and drive assembly retainer and snap ring.

(11) with two lock washers (3) and screws (2). Reassemble screw and lock washer (1). Apply a suitable sealing compound between solenoid, field frame, flange, and junction.

(11) The pinion clearance cannot be adjusted but should be checked after reassembly to ensure proper clearance. Improper clearance is an indication of worn parts. Check the clearance as follows:

(a) Disconnect the motor field coil connector from the solenoid motor terminal and INSULATE IT CAREFULLY.

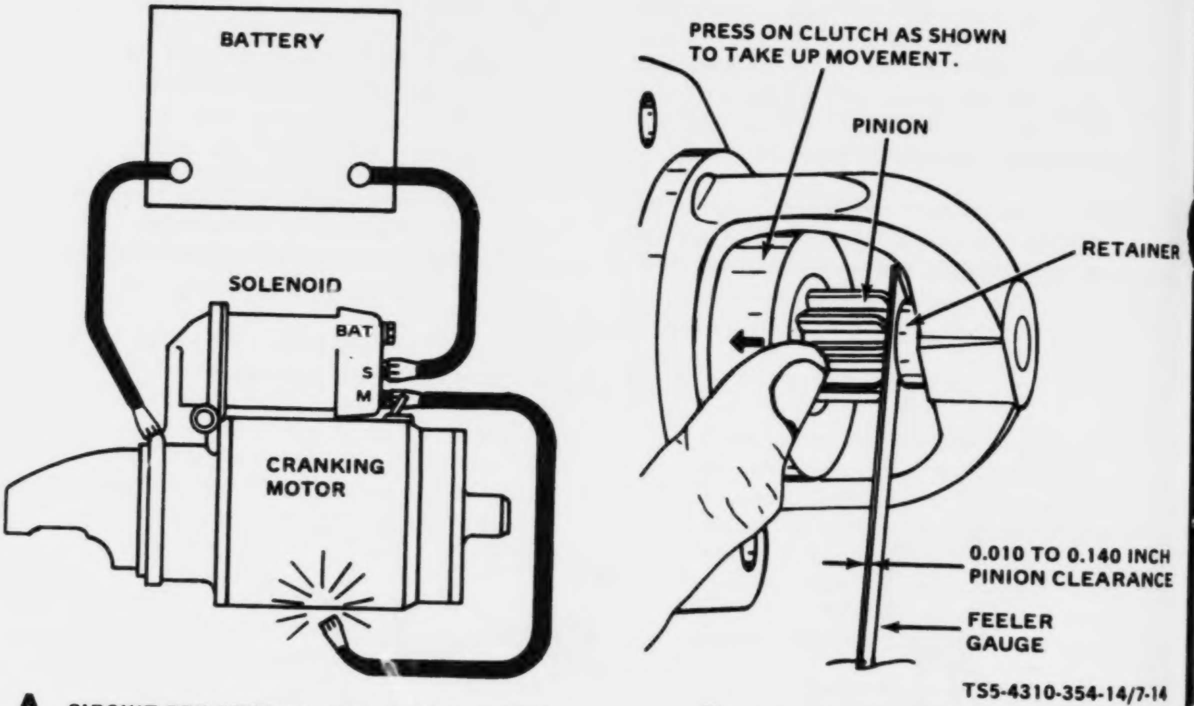
(b) Connect a 12-volt battery from solenoid switch terminal to the solenoid frame (figure 7-14).

(c) MOMENTARILY flash a jumper lead from the solenoid motor terminal to the solenoid frame. This will shift the pinion into cranking position and it will remain so until the battery is disconnected.

(d) Push the pinion back towards the commutator end to eliminate slack movement.

(e) Check the distance between pinion and pinion stop as shown in figure 7-14.

g. Installation. Install the starting motor assembly (figure 4-24).


BATTERY
SOLENOID
BAT
S
M
CRANKING MOTOR
PRESS ON CLUTCH AS SHOWN TO TAKE UP MOVEMENT.
PINION
RETAINER
0.010 TO 0.140 INCH PINION CLEARANCE
FEELER GAUGE
TS5-4310-354-14/7-14

A CIRCUIT FOR CHECKING PINION CLEARANCE

B CHECKING PINION CLEARANCE

Figure 7-14. Checking pinion clearance.

Section III. FUEL INJECTION NOZZLES

7-5. General. The fuel injection nozzles receive fuel under high pressure from the fuel injection pump via the fuel injection lines. The fuel charge is properly timed to engine operation so that the nozzle introduces a finely atomized spray of fuel into each cylinder at the exact instant necessary for the engine power strokes.

7-6. Fuel Injection Nozzles.

a. Removal. Remove the fuel injection nozzles (figure 4-26).

b. Disassembly. Use a twelve point, ⅜-inch box wrench and remove the fuel nozzle retaining nut from the holder assembly. Carefully remove the fuel nozzle and washer from the nozzle holder.

NOTE:

The fuel nozzles and holder assemblies must be handled with care at all times. Use only authorized repair tools and test equipment.

c. Cleaning, Inspection, and Repair.

(1) Clean the fuel injection nozzles in clean diesel fuel. Dry thoroughly with filtered, dry compressed air.

(2) Inspect the fuel nozzles, holder assemblies, and retaining nuts for cracks, breaks, damaged threads, or any other defect.

(3) Replace damaged fuel nozzle and holder as an assembly.

d. Reassembly. Use new washers at reassembly and assemble in the reverse of disassembly (para 7-6.*b*.)

e. Testing.

CAUTION

The fuel injection nozzles and holder assemblies must be handled with care at all times. The nozzle and holder assemblies should be tested and adjusted only by fuel system technicians using proper testing equipment.

(1) Use a static fuel nozzle testing fixture to check nozzle operating pressure. The nominal opening pressure should be 2750 psi. To adjust the opening pressure, remove the cap nut and turn the adjusting screw clockwise to increase spring tension or counterclockwise to decrease. This adjustment raises or lowers opening pressure.

(2) New fuel injection nozzle and holder assemblies are shipped from the factory set at 2900 psi to compensate for the setting of the spring in the first few hours of operation.

f. Installation. Install the fuel injection nozzles (figure 4-26).

Section IV. FUEL INJECTION PUMP

7-7. General. The fuel injection pump receives fuel from the engine fuel transfer pump and distributes an accurately metered amount to each injection nozzle. The distribution is properly timed to the engine for delivery to the nozzles in relationship to the engine cylinder firing order. A flyball-type governor provides automatic control of the fuel charge in accordance with the engine load at any given speed range within the designed limits. The fuel injection pump is driven by an idler gear at one half the speed of the engine crankshaft. The pump requires no special lubrication since it is lubricated with the filtered fuel it pumps.

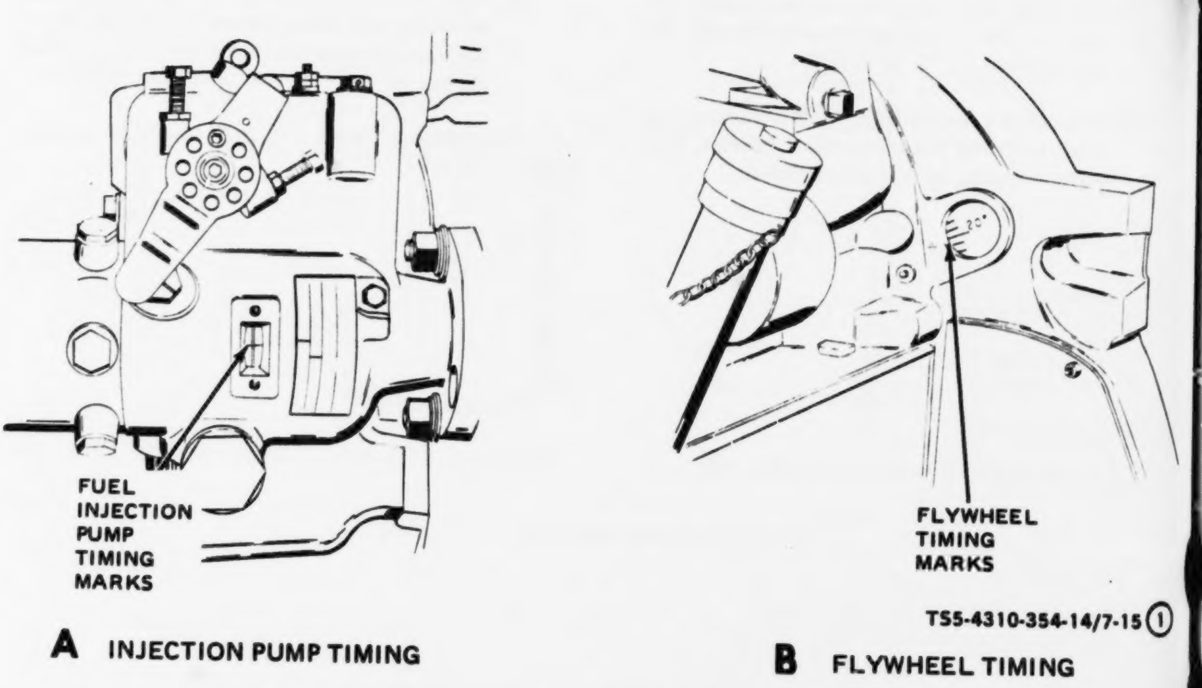
7-8. Fuel Injection Pump.

a. Removal.

(1) Remove the radiator and oil cooler group (figure 4-18).

(2) Clean the fuel injection pump in the areas of fuel line connections to prevent dirt from entering system during removal.

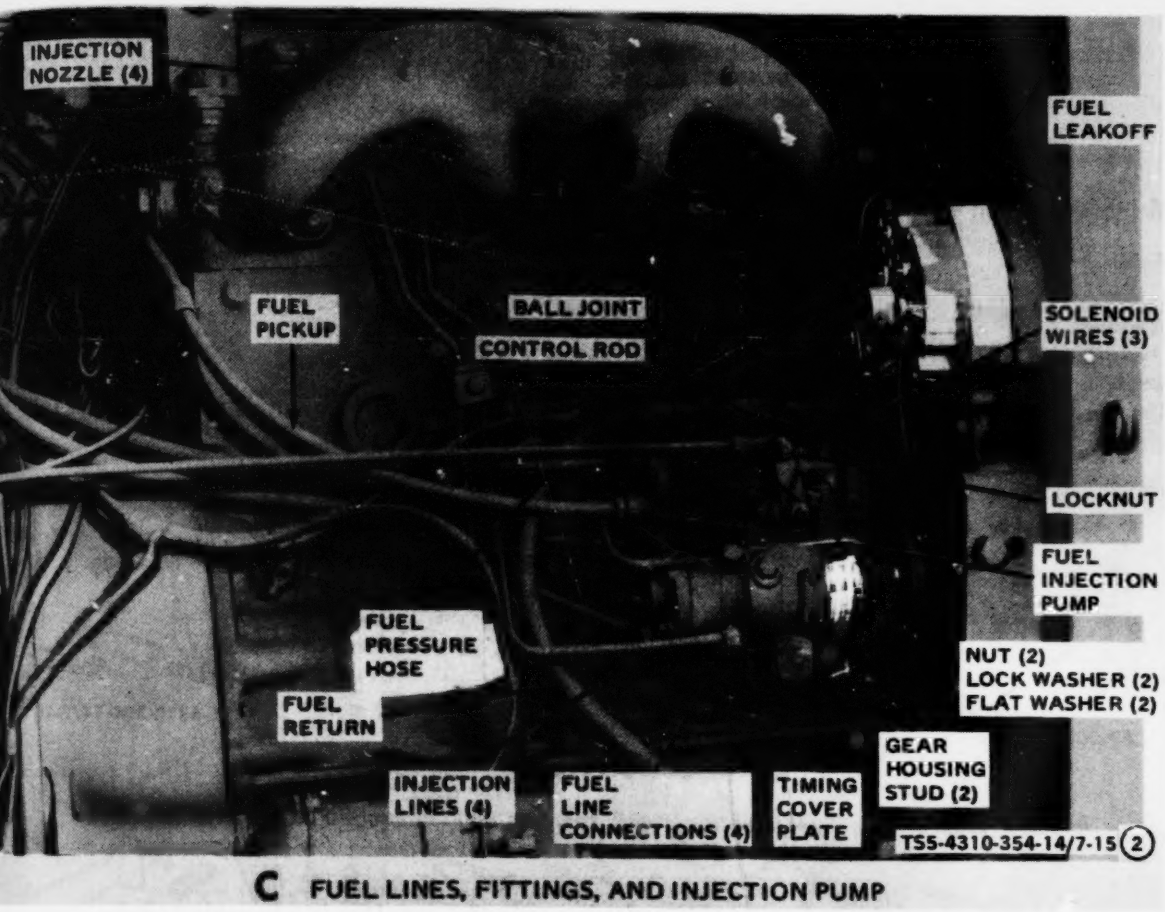
(3) Remove cover plate from the side of fuel injection pump and turn the engine crankshaft in normal rotation until timing lines on the pump can be seen. Align the timing lines (figure 7-15).



A INJECTION PUMP TIMING

B FLYWHEEL TIMING

Figure 7-15. Fuel injection pump, removal and installation (sheet 1 of 3).


INJECTION NOZZLE (4)
FUEL LEAKOFF
FUEL PICKUP
BALL JOINT
CONTROL ROD
SOLENOID WIRES (3)
LOCKNUT
FUEL INJECTION PUMP
FUEL PRESSURE HOSE
FUEL RETURN
NUT (2)
LOCK WASHER (2)
FLAT WASHER (2)
GEAR HOUSING STUD (2)
INJECTION LINES (4)
FUEL LINE CONNECTIONS (4)
TIMING COVER PLATE
TS5-4310-354-14/7-15②

C FUEL LINES, FITTINGS, AND INJECTION PUMP

Figure 7-15. Fuel injection pump, removal and installation (sheet 2 of 3).

(4) Check that number 1 cylinder is at 20° before top dead center. Determine this as follows:

(a) Remove injection nozzle from number 1 cylinder. Place thumb over the nozzle opening and feel for air being forced out during the compression stroke as the engine is cranked.

(b) Check the timing mark on the flywheel in relation to the timing mark on the fuel injection pump. With fuel injection pump timing marks aligned exactly, the exact injection timing is indicated by the degree mark on the flywheel aligned with the timing pointer. This degree should be 20° (figure 7-15).

(5) Disconnect the fuel pickup hose, fuel pressure hose, fuel return hose, fuel line leakoff line, and the four fuel injection lines from the pump. Reinstall the fuel connection screws and washers to prevent dirt from entering pump. Remove all other fuel line fittings and plug the fitting openings in the pump (figure 7-15).

(6) Remove lock nut from control rod swivel ball joint and disconnect ball joint from pump lever. Disconnect all wires from pump solenoid terminals (figure 7-15).

(7) Remove cap screws, lock washers, thrust plate, gasket, nut, lock washer, and injection pump drive gear (figure 7-15).

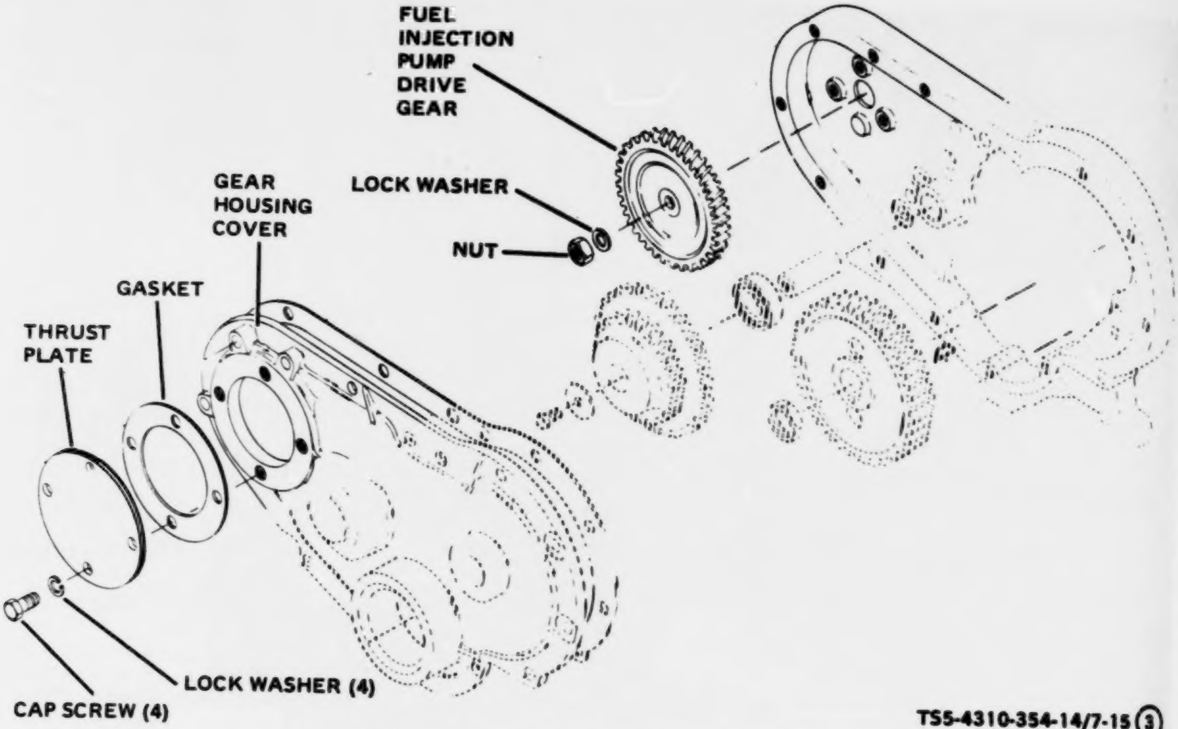

FUEL INJECTION PUMP DRIVE GEAR
LOCK WASHER
NUT
GEAR HOUSING COVER
GASKET
THRUST PLATE
LOCK WASHER (4)
CAP SCREW (4)
TS5-4310-354-14/7-15 ③
D INJECTION PUMP DRIVE GEAR

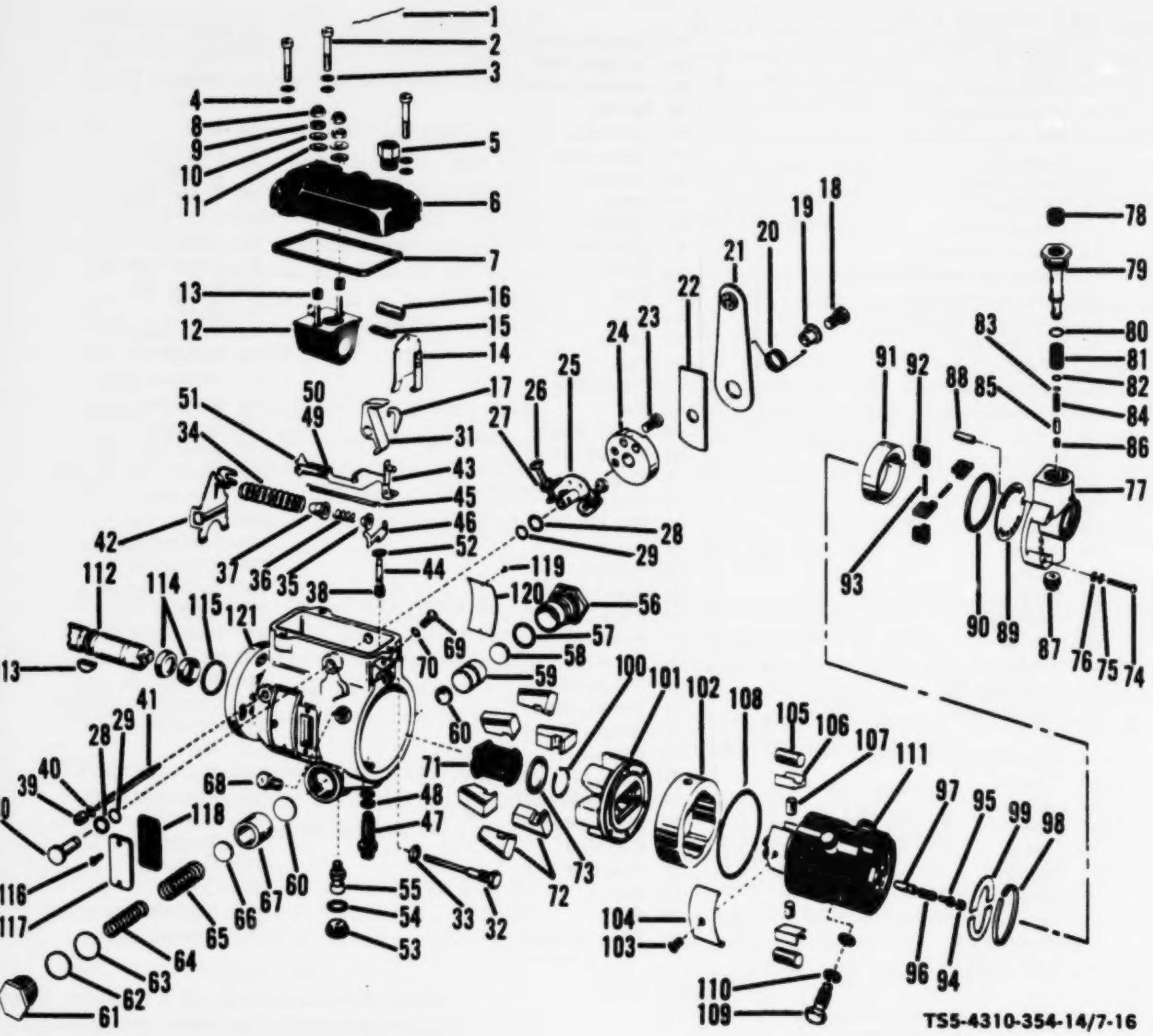
Figure 7-15. Fuel injection pump, removal and installation (sheet 3 of 3).

(8) Remove nuts, lock washers, and flat washers that secure fuel injection pump to gear housing studs. Remove the fuel injection pump.

NOTE

If fuel injection pump is to be transported to another area, or stored, secure the throttle lever in full open position after removal from engine. This will prevent the governor weights from dislodging inside of the pump housing.

b. Disassembly. Disassemble the fuel injection pump in the numerical sequence shown in figure 7-16 and detailed instructions as follows:


1
2
3
4
8
9
10
11
5
6
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13
12
16
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21
22
23
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26
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17
31
51
50
49
34
43
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46
52
44
42
37
36
35
38
28
29
112
114
115
121
119
120
56
57
58
59
60
69
70
13
41
28
29
40
39
0
68
48
47
118
116
117
65
66
67
60
64
63
62
61
55
54
53
33
32
71
72
73
100
101
102
108
105
106
107
111
104
103
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109
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80
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TS5-4310-354-14/7-16

Figure 7-16. Fuel injection pump, disassembly and reassembly.

KEY to figure 7-16:

1. Wire and seal (3)
2. Screw (3)
3. Lock washer (3)
4. Flat washer (3)
5. Fuel line connector
6. Cover
7. Cover gasket
8. Lock nut (2)
9. Contact nut (2)
10. Contact washer (2)
11. Insulating washer (2)
12. Solenoid frame assy
13. Insulating tube (2)
14. Coil arm assy
15. Spring
16. Spring sleeve
17. Retaining clip
18. Screw
19. Retainer
20. Spring
21. Lever assy
22. Arm
23. Screw
24. Spacer
25. Throttle shaft assy
26. Screw (2)
27. Nut (2)
28. Washer (3)
29. Shaft seal (2)
30. Shutoff shaft
31. Lever
32. Guide stud
33. Washer
34. Spring
35. Guide
36. Spring
37. Retainer
38. Spring
39. Nut (2)
40. Shaft seal (2)
41. Pivot shaft
42. Governor arm
43. Linkage hook
44. Metering valve
45. Spring
46. Arm assy
47. Screw assy
48. Seal (2)
49. Screw
50. Washer
51. Link assy
52. Shim
53. Plug
54. Seal
55. Screw
56. Plug
57. Piston ring
58. Seal
59. Power piston
60. Washer (2)
61. Plug
62. Seal (2)
63. Seal (2)
64. Spring
65. Spring
66. Shim (AR)
67. Piston
68. Screw (2)
69. Screw (2)
70. Washer (2)
71. Thrust sleeve
72. Weight (6)
73. Washer
74. Screw (4)
75. Lock washer (4)
76. Flat washer (4)
77. End plate
78. Plug assy
79. Sleeve
80. Seal
81. Filter element
82. Seal
83. Ring
84. Spring
85. Piston
86. Seal
87. Pipe plug
88. Rollpin
89. Thrust plate
90. Seal
91. Liner
92. Pump blade (4)
93. Spring (2)
94. Screw
95. Valve stop
96. Spring
97. Delivery valve
98. Retaining ring
99. Retainer (2)
100. Retaining ring
101. Weight retainer assy
102. Cam ring
103. Screw
104. Leaf spring
105. Cam roller (2)
106. Roller shoe (2)
107. Plunger (2)
108. Seal
109. Screw (4)
110. Washer (8)
111. Head and rotor assy
112. Drive shaft
113. Key
114. Shaft seal (2)
115. Pilot tube seal
116. Screw (4)
117. Timing cover (2)
118. Gasket (2)
119. Screw (2)
120. Identification plate
121. Housing assy

CAUTION

Disassembly of the fuel injection pump shall be conducted in a clean work area. Use clean tools and clean hands. Provide a clean, deep drawn pan, in which disassembled parts may be placed, with rounded corners to lessen the chance of dirt pockets. Also, have available a similar pan containing clean fuel oil for flushing disassembled parts.

(1) Mount the fuel injection pump in a vise using a holding fixture such as Roosa Master Fixture No. 13363, or equivalent. Cut and remove three wires and seals (1). Remove three screws (2), lock washers (3), and flat washers (4). Lift cover and solenoid assembly off of housing (121) and remove cover gasket (7).

(2) Disassemble cover and solenoid assembly by removing fuel line connection (5) from cover (6), remove two each lock nuts (8), contact nuts (9), contact washers (10), and insulating washers (11). Work the solenoid frame assembly (12) out of cover (6) and remove two insulating tubes (13). Disconnect and remove spring (15), spring sleeve (16), and coil arm assembly (14).

(3) Rotate throttle shaft assembly to full shutoff position (retaining clip (17) in horizontal position). Place a suitable tool such as Roosa Master No. 13339, or equivalent,

between housing (121) and linkage hook (43) and pry gently, sliding retainer clip (17) out of its groove and off of the throttle shaft.

(4) Disassemble screw (18), retainer (19), spring (20), lever assembly (21), and arm (22). Remove screw (23) and spacer (24). Withdraw throttle shaft assembly (25) and shutoff shaft (30) freeing lever (31) for removal. As necessary, remove two each screws (26) and nuts (27) from throttle shaft assembly (25). Remove two each washers (28) and shaft seals (29).

(5) Hold governor spring (34), idle spring guide (35), idle spring (36), and spring retainer (37) firmly between thumb and forefinger. Remove guide stud (32) and washer (33). Lift out the springs, guide, and retainer (34, 35, 36, 37).

(6) Pull linkage hook (43) back slightly, disengage and remove spring (45) and the linkage hook (43). Only when necessary, disassemble hook (43) by removing screw (49), washer (50), and link assembly (51).

(7) Remove one pivot shaft cap nut (39) and seal (40). Withdraw pivot shaft (41) from housing (121) freeing governor arm (42).

(8) Lift out the metering valve group and remove spring (38) and shim (52). Only as necessary, disassemble metering valve (44) and arm assembly (46).

(9) Remove two head locking screws (68). With fuel injection pump still mounted in the fixture, invert and clamp the fixture in a vise with end plate (77) facing the disassembler. Remove head locating screw assembly (47) and two seals (48). Remove plug (53), seal (54), and cam advance screw (55).

(10) Disassemble plug (56), piston ring (57), seal (58), power piston (59), and one washer (60). Disassemble plug (61), seals (62), seals (63), inner advance spring (64), outer advance spring (65), shims (66), spring piston (67), and the second washer (60).

(11) Again invert the pump and holding fixture in the vise. Remove two torque screws (69) and washers (70). Grasp the hydraulic head firmly with both hands and withdraw from the housing with a slight rotary motion being careful not to drop weights (72). Holding this assembly, invert and allow weights (72), thrust sleeve (71), and washer (73) to fall into your hand.

(12) Place the hydraulic head assembly in a suitable holding fixture in a vise, holding at the governor weight retainer (101). Remove four each screws (74), lock washers (75), and flat washers (76). Disassemble end plate (77), plug assembly (78), sleeve (79), seal (80), filter element (81), seal (82), ring (83), spring (84), piston (85), and seal (86). Remove plug (87) from end plate (77) and as necessary rollpin (88). Remove thrust plate (89) and seal (90).

(13) Disassemble transfer pump liner (91), four pump blades (92), and two springs (93). Remove delivery valve retaining screw (94), lift the head and rotor assembly and shake valve stop (95), spring (96), and delivery valve (97) into your hand.

CAUTION

When retainers (99) are removed, the rotor is no longer retained in the head and rotor assembly (111). Do not allow these parts to slip apart. Handle carefully.

(14) Use a small-bladed screwdriver or a dull scribe to disengage and remove retaining ring (98). Gently lift hydraulic head so that transfer pump rotor is flush with inner face of hydraulic head. Remove retainers (99) and lower hydraulic head to former position. Remove retaining ring (100), weight retainer assembly (101), and cam ring (102).

(15) Before removing leaf spring (104), use a micrometer to check and record the roller-to-roller dimension. Correct dimension is 1.9555 to 1.9585 inches (49.6697 to 49.7459 mm). Setting of this dimension is detailed in the reassembly paragraph.

CAUTION

When removing rotor plungers (107), DO NOT HANDLE SHANKS. Hold the plungers on the ends only.

(16) Disassemble leaf spring screw (103), leaf spring (104), two each cam rollers (105), roller shoes (106), and plungers (107). Remove seal (108), four screws (109), and eight washers (110) from head and rotor assembly (111).

(17) Remove drive shaft (112) and tape key (113) in shaft keyway to prevent its loss. Remove two each shaft seals (114) and pilot tube seals (115).

(18) Remove four screws (116), two timing covers (117), and two gaskets (118). (One cover on each side of housing (121).) Screws (119) and identification plate (120) should not be removed from housing (121) except for replacement.

c. *Cleaning, Inspection, and Repair.*

(1) Wash parts in accordance with paragraph 5-7.*f*; then, place in a clean pan containing clean diesel fuel.

(2) Discard and replace all o-rings, seals, and gaskets.

(3) Inspect all springs for fretting, wear, distortion, breakage, or any other defect.

(4) Inspect all bores, grooves, and seal seats for damage, wear, or any other defect.

(5) Inspect all parts for foreign material and rust.

(6) Inspect end plate regulating piston (85) for excessive wear, nicks or chipping, freedom of movement, or any other defect.

(7) Inspect end plate (77) for cracks, excessive wear from thrust plate (89), damaged threads, or any other defect.

(8) Inspect end plate inlet filter element (81) for punctures in screen, broken soldered joint, or any other defect.

(9) Inspect transfer pump liner (91) for nicks, scratches, excessive wear, or any other defect.

(10) Inspect transfer pump blades (92) for chipping of edges, pitting, imbedded foreign particles, and wear on rounded ends. Measure length for wear. Minimum length is 1.0930-inches (27.762 mm). If defects are noted, replace the blades.

(11) Inspect rotor plungers (107) for free movement. While holding the rotor submerged in clean fuel oil, insert the plungers into their bore. Hold thumb and forefinger over the guide slots and tilt from side to side several times to ensure complete freedom of movement. Interchanging or reversing their individual position may be necessary as these are matched parts. If the plungers were sticking, but not visibly damaged, clean both plungers and bore with a soft brush and lacquer-removing solvent such as lacquer thinner or acetone. (Do not force plungers into their bores and do not handle rotor shank.)

(12) Inspect the distributor rotor radii contacted by the leaf spring (104), the tang slot, and the weight retainer drive on the large end for excessive wear. Check all slots, charging and discharged ports for chipping of edges or dirt, and the rotor shank for scratches. If damage or excessive wear is apparent, the head and rotor (111) must be replaced as a mated unit.

(13) Check each roller (105) in its shoe (106) for freedom of rotation, and the top edge of each shoe, where retained by the leaf spring (104), for chipping or excessive wear. Improved roller surfaces will result from long, normal operation in clean fuel oil.

(14) Check leaf spring (104) for wear at points where the spring contacts the radii on the rotor, and along the steps that retain the roller shoes.

(15) Examine drive shaft pilot tabs in governor weight retainer (101) hub, retainer sockets where weights pivot, and pivot points of all weights (72) for wear. If damage is noted the complete retainer (101) must be replaced as a unit.

(16) Inspect the pivot points of the governor control arm (42) and pivot shaft (41). Examine the control arm fork where it contacts the thrust sleeve (71). If wear is in excess of 0.003 inch (0.076 mm), discard and replace. Examine the metering valve pin hole in the linkage hook (43), the spring retainer (19), throttle shaft lever (21), shut-off cam (31), and especially the throttle (25) and shutoff shaft (30) assemblies where joined, for looseness.

(17) Check the metering valve body (44) for wear. Be sure the metering valve arm (46) is well seated and that there is no radial movement of the arm on the valve. Check the metering valve spring (38) for breakage or distortion, and the metering valve arm pin for wear at its point of contact with the linkage hook (43).

(18) Inspect the inside diameter of the cam (102) and edges of all flat surfaces. Only the working portions of the lobes on the inside diameter are ground. The tool marks between lobes should not be considered damage. The cam finish is mottled from heat treatment rather than operation. If there is evidence of spalling or flaking out, replace with new cam (102).

(19) Inspect the drive shaft (112) tang. Distance across flats shall not be less than 0.305 inch (7.747 mm). Check the shaft diameter where governor thrust sleeve (71) slides. The drive shaft seal grooves must be absolutely smooth for seals to function properly.

(20) Inspect all parts for cracks, breaks, distortion, damaged threads, or any other defect.

d. *Reassembly*. Reassemble the fuel injection ump in the following sequence.

CAUTION

All parts must be thoroughly cleaned and flushed in clean fuel oil as assembly progresses. All seals, gaskets, and o-ring preformed packing must be replaced at assembly, whether visibly damaged or not.

NOTE

Before and during assembly, refer to table 1-1 for torque requirements.

(1) Insert regulating piston (85) into sleeve (79), hold sleeve between thumb and forefinger and shake slowly. The piston (85) should slide freely by its own weight. Reassemble seal (80), filter element (81), seal (82), ring (83), spring (84), piston (85), and seal (86) onto sleeve (79). Install plug (78) in sleeve (79). Hold end plate (77) horizontally and sight down inlet bore to make certain that the lower sleeve seal will not catch or be damaged by any nicks or sharp edges. Apply a light coating of a mineral grease to seals (86, 82, 80) to aid assembly of sleeve (79). Carefully, using a turning motion, insert the sleeve (79) into end plate (77). Install pipe plug (87) and if disassembled, reassemble rollpin (88) into end plate (77). Lay this assembly aside until ready to reassemble onto head and rotor assembly (111).

CAUTION

DO NOT HANDLE plungers (107) on their shanks. Hold plungers on the ends only. Do not force plungers into distributor rotor bores. Do not handle rotor shank.

(2) Hold distributor rotor under clean oil and insert plungers (107) into their bores. With thumb and forefinger over the guide slots, tilt from side to side several times to ensure complete freedom of movement. Interchanging or reversing plunger positions may be necessary as these are matched parts.

(3) Flush hydraulic head and distributor rotor (111) thoroughly in clean oil and assemble, under oil, with a slight rotary motion. Do not force. Do not handle rotor shank with fingers. Hold fingers over plunger slots so that plungers do not drop out of bores.

(4) Place the hydraulic head and rotor assembly (111) in a holding fixture (figure 7-17) and assemble leaf spring (104, figure 7-16). Apply a small amount of clean grease on the edges of leaf spring hole before assembling

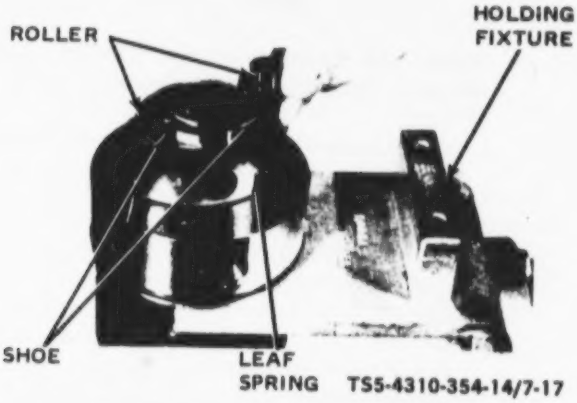

ROLLER
HOLDING FIXTURE
SHOE
LEAF SPRING
TS5-4310-354-14/7-17

Figure 7-17. Leaf spring, shoes, and rollers, assembly.

screw (103) to make adjusting easier. Assemble screw (103) to hold leaf spring (104) but do not tighten at this point. Assemble the cam roller shoes (106) and cam rollers (105). Check for freedom of movement. Set the roller-to-roller dimension as follows:

(a) By means of a suitable fitting to any one of the hydraulic head outlets, apply clean, dry air pressure of 30 to 100 psi (2.11 to 7.03 KG/CM²). Rotate the rotor until the cam rollers (105) are pushed to their extreme outward position by the air pressure.

(b) Measure the roller-to-roller dimension. Proper setting of this dimension is 1.95555 to 1.9585 inches (49.6697 to 49.7469 mm).

(c) To set this dimension, use a socket screwdriver and turn the leaf spring adjusting screw (103, figure 7-16) clockwise to increase travel and counterclockwise to reduce travel. When dimension is set, relieve air pressure and remove air pressure fitting.

NOTE

The roller-to-roller dimension provides the accurate maximum fuel setting and shall not be altered from dimension given in step (b) above.

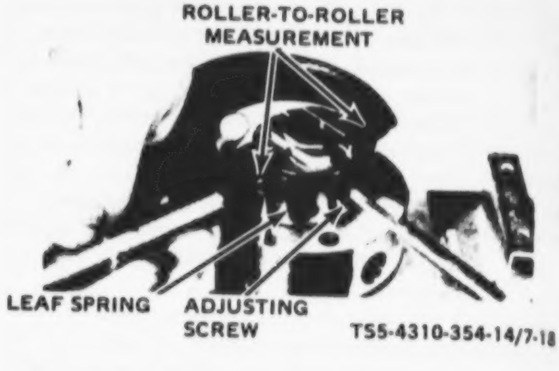

ROLLER-TO-ROLLER MEASUREMENT
LEAF SPRING
ADJUSTING SCREW
TS5-4310-354-14/7-18

Figure 7-18. Roller-to-roller dimension setting.

(5) Place cam ring (102) on the hydraulic head with rotational direction arrow facing upward. Place governor weight retainer (101) in position over the drive on the distributor rotor. Align the assembly marks of weight retainer and rotor. Install retaining ring (100). Refer to figure 7-19.

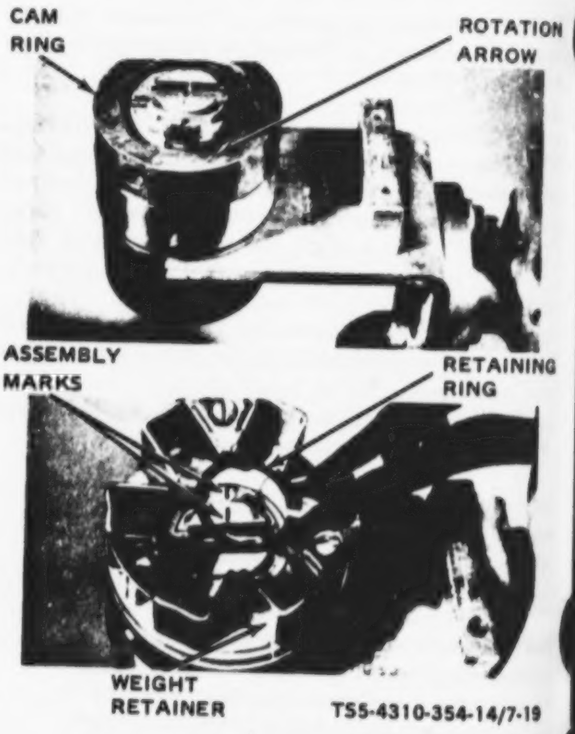
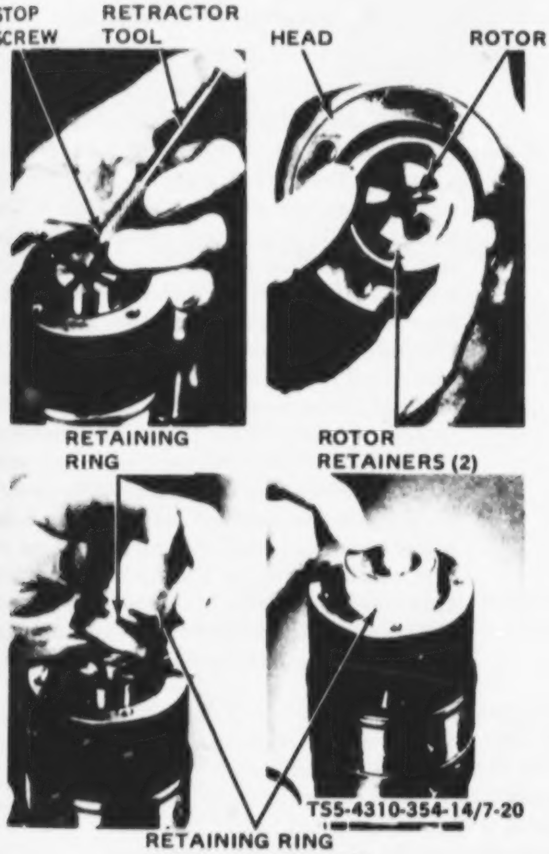

CAM RING
ROTATION ARROW
ASSEMBLY MARKS
RETAINING RING
WEIGHT RETAINER
TS5-4310-354-14/7-19

Figure 7-19. Cam ring and weight retainer assembly.

(6) Carefully hold assembly together so rotor will not fall out and invert the entire unit so that weight retainer (101, figure 7-16) engages a bar on the holding fixture. Assemble delivery valve (97) making certain it operates freely in bore. Assemble delivery valve spring (96) and delivery valve stop (95). The stop screw (94) internal hex has one end which is slightly relieved to clear delivery valve stop (95). Make certain this relieved end of screw (94) faces down and assemble screw (94). With torque wrench, tighten screw (table 1-1).

(7) Lift the hydraulic head slightly so that inside face of the head is flush with rotor end. Insert the two rotor retainers (99). Position retainers (99) with outer sleeve of Roosa Master Retaining Ring Installation Tool, or equivalent, and install retaining ring (98). Refer to figure 7-20.

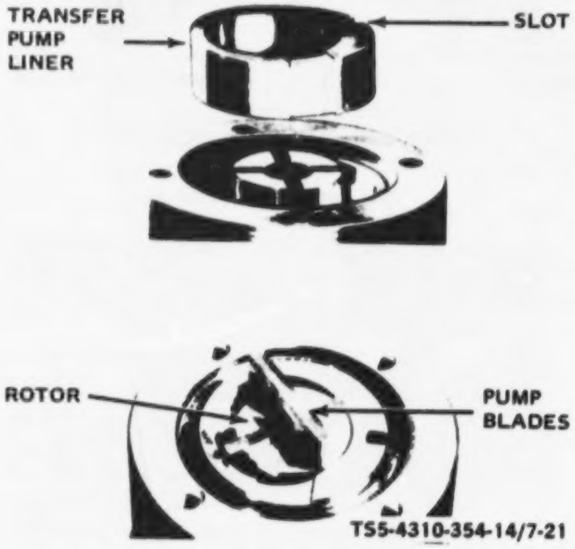


TS5-4310-354-14/7-20

Figure 7-20. Delivery valve and rotor retainer, assembly.

(8) Assemble transfer pump liner (91, figure 7-16) into hydraulic head so that large slot is in line with head locating screw hole and the letter indicating correct pump rotation faces upward.

(9) Carefully assemble transfer pump blade springs (93) and blades (92) in slots of transfer pump rotor. With one finger, rotate the liner (91) several times to check for binding; then, reposition liner to correct position outlined in paragraph (8) above. Refer to figure 7-21.



TS5-4310-354-14/7-21

Figure 7-21. Transfer pump liner and blades, assembly.

(10) Assemble thrust plate (89, figure 7-16) and seal (90). Mount end plate (77) so that inlet is in line with metering valve (44) bore. Locating pin (B, figure 7-22) will now align with locating slot (A, figure 7-22) in the transfer pump liner.

NOTE:

If locating pin and slot are 180° out of alignment, check end plate (77, figure 7-16) for correct location of pin (88) with respect to pump rotation [C or CC as marked on outside of end plate (77)].

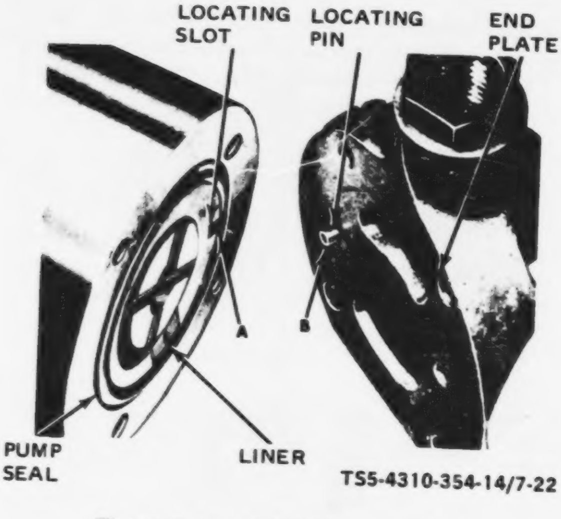


Figure 7-22. End plate, assembly.

(11) Attach end plate (77) to hydraulic head and distributor assembly (111) with flat washers (76), lock washers (75), and screws (74).

(12) Place hydraulic head and rotor assembly (111), with drive end up, into open end of holding fixture. Place the six governor weights (72, figure 7-16) into sockets of weight retainer (101) with weight slots facing the assembly bore. Place governor sleeve thrust washer (73) against thrust sleeve (71) with chamfered edge facing the sleeve. Hold the sleeve and thrust washer together with forefinger inserted through bore. Insert sleeve and thrust washer into the slots of weights (72) by tilting the weights back slightly. The tab on the thrust sleeve flange should face upward. Sight across the tops of the assembled weights to make certain of correct positioning. A weight higher than any other indicates incorrect assembly of thrust washer (73).

(13) Place governor arm (42) in position with fork for governor linkage hook facing end plate (77). Insert pivot shaft (41) (with knife edge of shaft facing end plate) through housing (121) bores and through governor arm (42). Assemble the two seals (40) and cap nuts (39). Torque nuts (39) (table 1-1). Refer to figure 7-23.

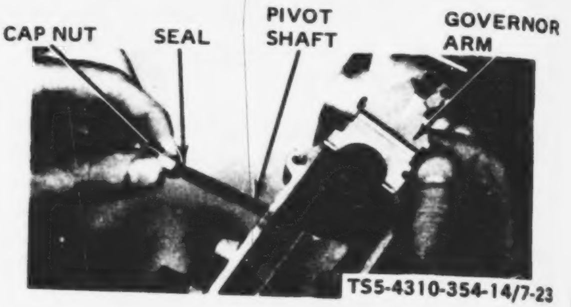
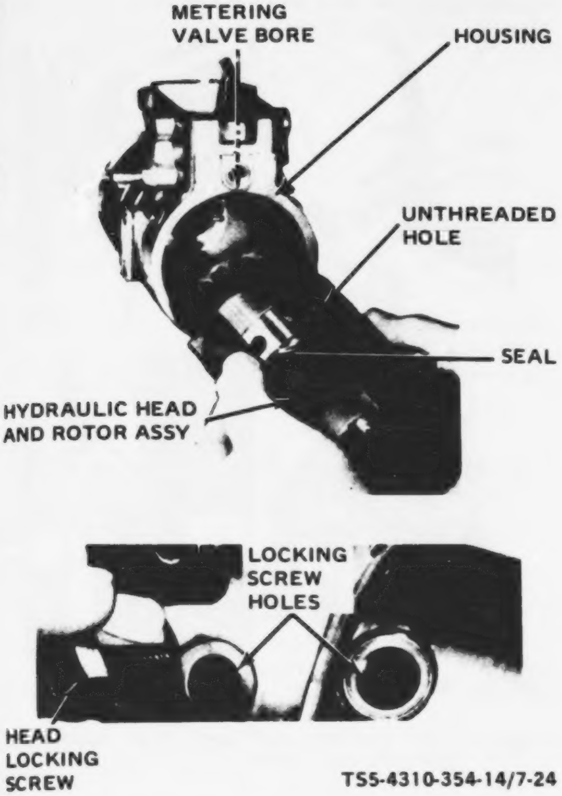


Figure 7-23. Governor arm, assembly.

(14) Install a new seal (108, figure 7-16) on the hydraulic head (111). Apply a light film of clean grease around the inside edge of the housing (121) bore to aid assembly. Rotate cam ring (102) so that unthreaded hole in ring is in line with the metering valve (44) bore in housing (121) to ensure proper positioning of cam ring (102). Grasp hydraulic head firmly with both hands and insert the assembly into housing bore with a slight rotary motion. Do not force. If assembly should cock during insertion, withdraw and begin assembly again. Make certain assembly is positioned into housing past the hydraulic head seal (108). When assembled to this position, rotate the hydraulic head until head locking screw holes in head and housing align. Assemble head locking screws (68) finger tight. Refer to figure 7-24.



TS5-4310-354-14/7-24

Figure 7-24. Hydraulic head and rotor, assembly.

(15) Invert the pump and fixture in the vise. Assemble automatic advance as follows:

CAUTION

Clockwise rotation pumps have power piston (59, figure 7-16) assembled on "C" side of pump.

(a) Assemble and tighten cam advance screw (55) (table 1-1). Install plug seal (54) and plug (53).

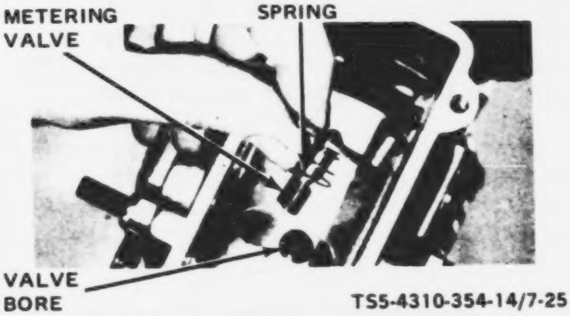
(b) Rinse slide washers (60) and pistons (59, 67) in clean oil. Stick washers (60) to power piston (59) and spring piston (67) ends with clean grease. Slide both pistons (59, 67) into bore, seating the slide washers (60) squarely on cam advance screw (55). Make certain power piston (59) is assembled on correct side of housing. Move pistons back and forth to ensure freedom of movement. Install power piston seal (58), piston ring (57), and plug (56).

(c) Install shims (66), insert outer spring (65) and inner spring (64) into spring piston (67). Install seals (63, 62) and plug (61).

(d) Install seal (48) and locating screw assembly (47). Tighten screw (47) (table 1-1).

(16) Turn pump and fixture upright in vise. Tighten head locking screws (68) (table 1-1).

(17) Place metering valve spring (38) on metering valve (44) and assemble valve into housing bore. Depress and rotate the valve into housing bore. Depress and rotate the valve several times to ensure freedom of movement. Refer to figure 7-25.



TS5-4310-354-14/7-25

Figure 7-25. Metering valve and spring, assembly.

(18) Pull back on governor linkage hook (43, figure 7-16) just far enough to assemble the hook correctly to the fork on governor arm (42). Position opposite end of hook assembly over the pin on the metering valve arm (46). Again check for freedom of movement. Assemble metering valve governor linkage spring (45).

(19) On work bench, assemble governor spring (34), spring retainer (37), idling spring (36), and spring guide (35). Pick up these parts between thumb and forefinger and engage spring (34) over tabs on governor arm (42). Insert guide stud (32), with washer (33), through tapped hole in housing (121) and into guide (35), spring (36), retainer (37), and spring (34). Tighten guide stud (32) (table 1-1). Refer to figure 7-26.

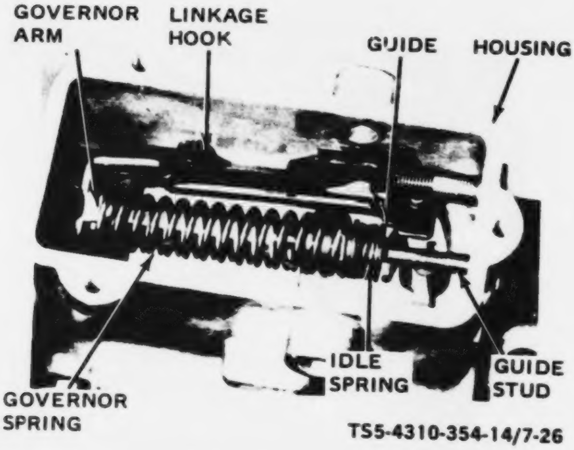


Figure 7-26. Governor springs and hook, assembly.

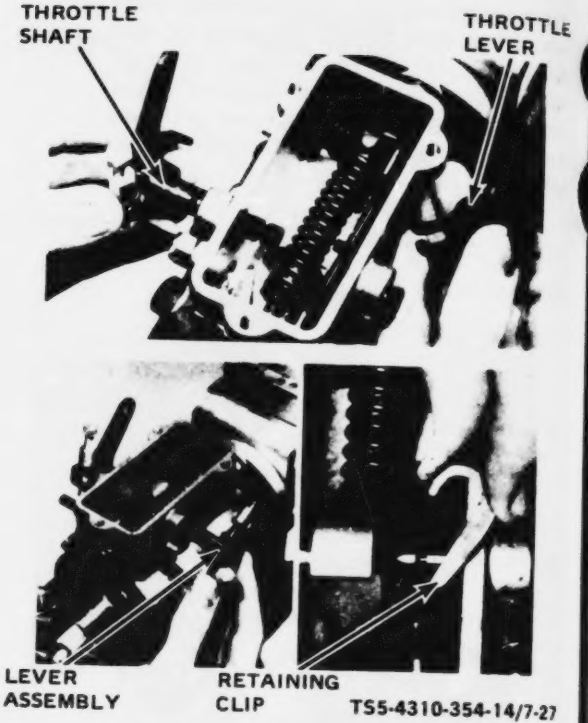


Figure 7-27. Throttle shaft and lever, assembly.

NOTE

The apparent looseness of governor parts is normal. Lost motion is taken up when pump rotates.

(20) Assemble seal washer (28, figure 7-16) and shaft seal (29) on shaft (30). Assemble shaft (30) partially through bore in housing. Slide throttle shaft lever (31) over shaft so that projection in lever bore engages with keyway in shaft. Position forked end of lever so that it straddles the guide stud (32). If removed from shaft assembly (25), assemble nuts (27) and screws (26). Assemble seal washer (28) and seal (29) on throttle shaft assembly (25). Assemble throttle shaft assembly (25) with slight rotary motion and firmly seat the lever assembly (25) and shaft (30). Locate and seat the retaining clip (17). Refer to figure 7-27.

(21) Assemble spacer (24, figure 7-16) to shaft assembly (25) positioning with screw (23). Assemble spacer arm (22), throttle lever assembly (21), spring (20), spring retainer (19), and secure to shaft assembly (25) with screw (18). Hook ends of spring (20) to lever (21) and arm (22). Install the washer (70) and screw (69).

(22) Lubricate shaft seals (114) with a light mineral grease and slide into grooves of drive shaft (112). Seals must face in opposite directions. Apply mineral grease liberally around shaft between seals. Assemble pilot tube seal (115). Note the small off-center hole in tang of drive shaft. This hole must coincide with similar hole in distributor rotor when shaft is installed. Carefully assemble drive shaft (112) into housing until tang of shaft engages with drive slot in distributor rotor. If removed from shaft, place key (113) in shaft keyway and tape until ready to assemble injection pump to engine.

(23) Refer to figure 7-28 and adjust governor linkage, as necessary, in the following sequence:

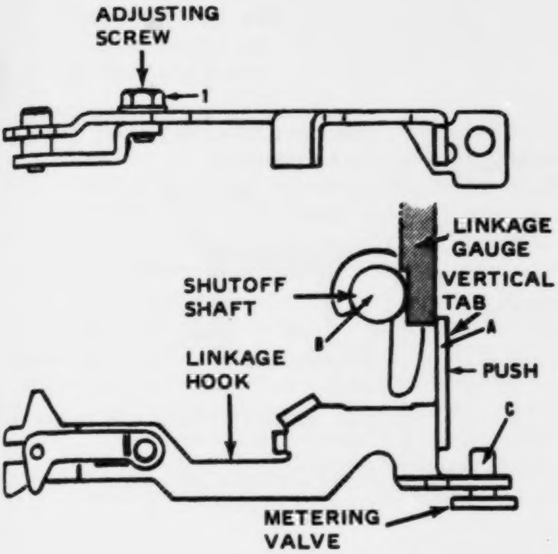


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Figure 7-28. Linkage adjustment.

(a) Place throttle lever in wide open position (and torque screw backed out) and check clearance between rear of shutoff shaft (B) and vertical tab (A) on linkage hook with linkage gauge, Roosa Master No. 13389, or equivalent.

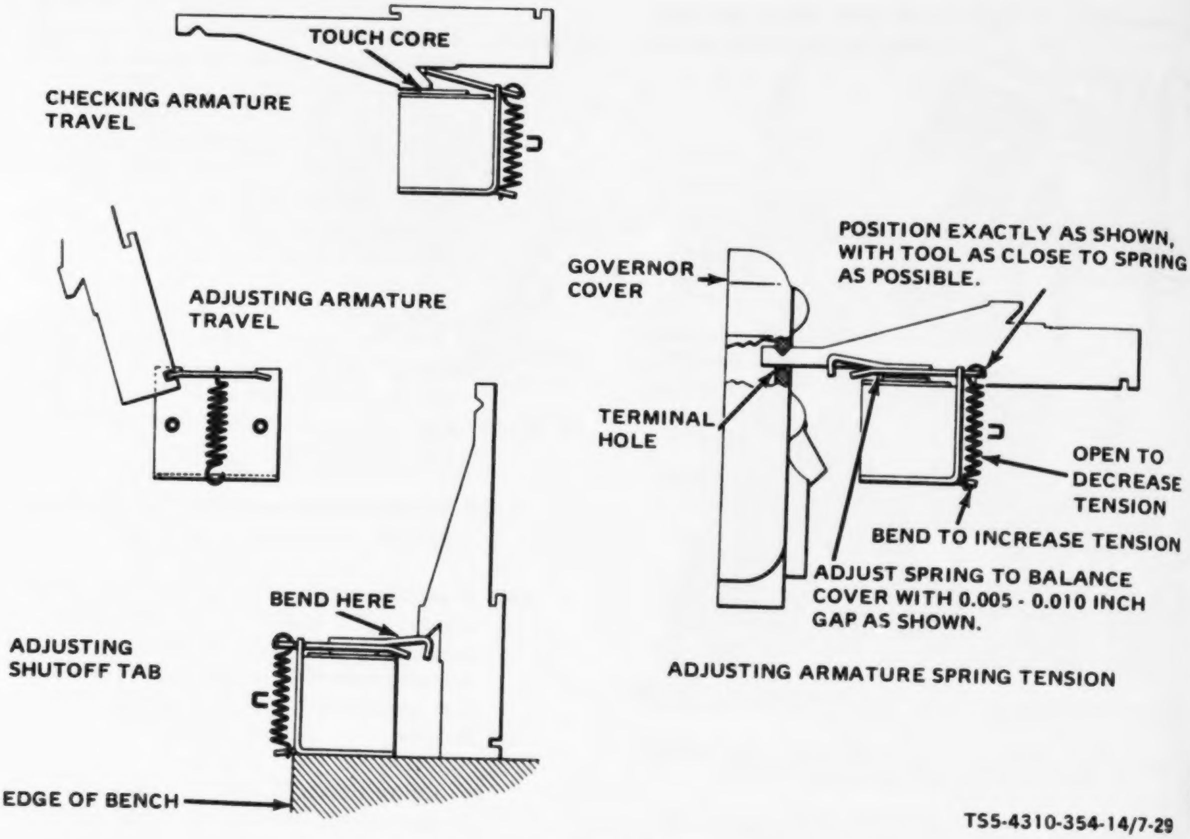
(b) With adjusting screw (1) tight, apply a slight pressure to tab (A). At the same time rotate pump one or two complete revolutions by turning drive shaft to assure that linkage is in full forward position. Loosen adjusting screw (1) and slide linkage to maximum open length.

(c) Insert Linkage Gauge between vertical tab (A) and shutoff shaft (B). Slide linkage hook together from rear until face of tab is flush against gauge.

(d) Tighten adjusting screw (1). Check adjustment and reset if required.

(24) Assemble spring (15, figure 7-16), spring sleeve (16), and arm assembly (14) to solenoid frame (12). Before assembly of solenoid assembly to the cover is made, adjust armature travel and spring travel as follows:

(a) Using Roosa Master Tool No. 14067, or equivalent, check and adjust armature travel and spring tension as shown in figure 7-29.


TOUCH CORE
CHECKING ARMATURE TRAVEL
ADJUSTING ARMATURE TRAVEL
POSITION EXACTLY AS SHOWN, WITH TOOL AS CLOSE TO SPRING AS POSSIBLE.
GOVERNOR COVER
TERMINAL HOLE
OPEN TO DECREASE TENSION
BEND TO INCREASE TENSION
ADJUST SPRING TO BALANCE COVER WITH 0.005 - 0.010 INCH GAP AS SHOWN.
ADJUSTING ARMATURE SPRING TENSION
BEND HERE
ADJUSTING SHUTOFF TAB
EDGE OF BENCH

TS5-4310-354-14/7-29

Figure 7-29. Armature and spring tension adjustment.

(b) Using same tool, adjust shutoff tab and spring tension as shown in figure 7-29.

(25) Install new insulating tubes (13, figure 7-16) on solenoid studs. Apply light coating of clean mineral grease to the tubes (13) and assemble solenoid assembly to cover (6). Assemble insulating washers (11), contact washers (10), contact nuts (9), and lock nuts (8) on solenoid stud terminals. Install fuel return connector (5) into cover (6). Using a new gasket (7), assemble the cover assembly (6) to housing (121) with three flat washers (4), lock washers (3), and screws (2). After testing and adjustment, install wires and seals (1).

(26) Assemble fuel line gaskets (110) and fuel line screws (109) finger tight until ready to install fuel injection lines after pump is installed on engine. Assemble the two cover gaskets (118), timing covers (117), and secure with screws (116). If removed from housing, install identification plate (120) with screws (119).

e. Bench Testing. After overhaul, prior to installation on the engine, the fuel injection pump should be bench tested as follows:

NOTE

All tests must be conducted using heated calibrating oil. Heat oil to 110°-115°F (43°-46°C). Use 12SD12 nozzles set to open at 2500 psi (175.75 KG/CM^2). Injection lines shall be $^3/_{32}$ inch (2.38 mm) inside diameter, 20 inches (508 mm) long. Fresh, clean oil is necessary for accurate testing and should be changed as often as excessive foam is noted.

NOTE

Pump adapters are available for the following makes of commercial test benches: American Bosch, TSE 7664, TSE 4500, TSE 4600; Unitest, U-4500, U-4600; Bacharach, GP-500C, SP-600; Hartridge, J,L.NU.

(1) Mount the pump securely on test bench using the appropriate adapter for bench being employed. Pumps having bronze pilot tubes must have shaft supplied with the pump removed and the pump mounted on the stand using shaft provided by test stand manufacturer. (No support bearing is required.) Refer to figure 7-30. Pumps having steel pilot tubes do not support the shaft in the housing and must be tested using an intermediate support bearing. (See figure 7-30.) Check the intermediate coupling disc for freedom of movement. Connect supply and return lines securely. (See figure 7-31.)

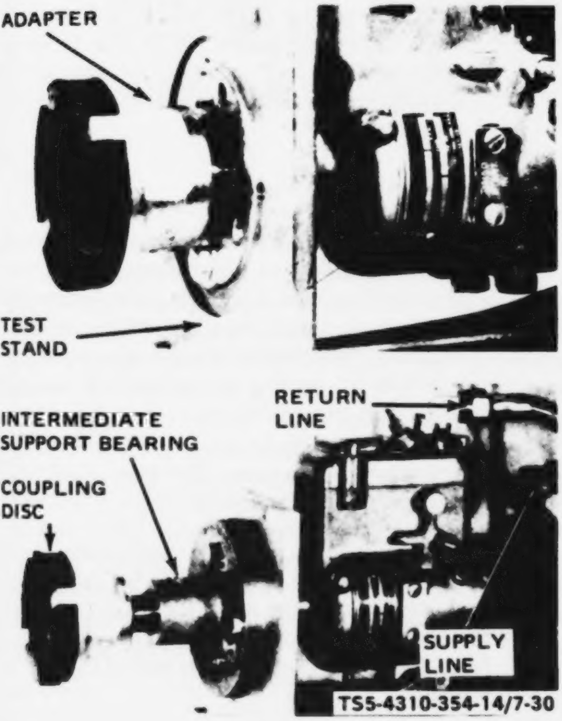


Figure 7-30. Bench test mounting.

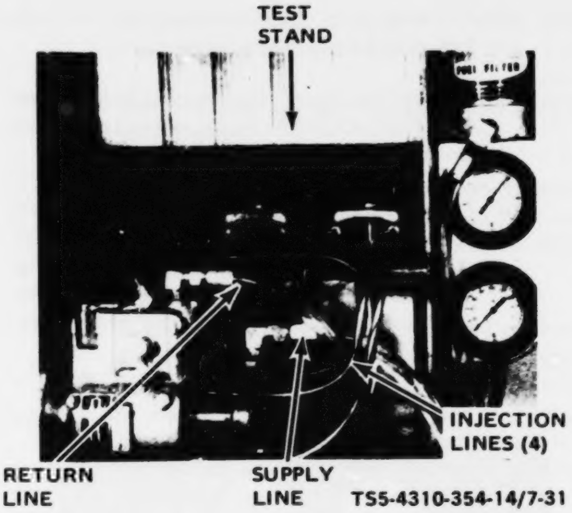


Figure 7-31. Fuel line connections, test setup.

(2) Install high pressure injection lines using new copper gaskets. Leave the fuel line connector screws at the pump and the injection line nuts and nozzles loose until air is bled from pump and lines.

NOTE

This pump's rotation direction is clockwise as viewed from drive end of pump.

(3) Start the stand at lowest speed. Move pump throttle to "full load" position. When transfer pump picks up suction, allow fuel to bleed for several seconds from the loose connector screws and from injection line nuts; then, tighten connector screws and injection line nuts securely.

(4) Operate the pump at full load rated speed of 2200 rpm for several minutes. Dry off completely with solvent and compressed air. Observe for leaks and correct as necessary.

(5) Close valve in supply line. Transfer pump must pull minimum of 15 inches Hg. If it does not, check for air leaks on suction side or malfunction of end plate and transfer pump parts.

(6) Fill test stand graduates to bleed air from test stand and to wet glass.

(7) Observe return oil. Return should be at rate of 100-450 CC/MIN. at 35 psi transfer pump pressure.

(8) Operate test stand at full load speed of 2200 rpm. Set counter for 1000 revolutions. Divert fuel to the graduates. Record reading. Difference between cylinders should not exceed 5 percent. Record transfer pump pressure. (See figure 7-32.)

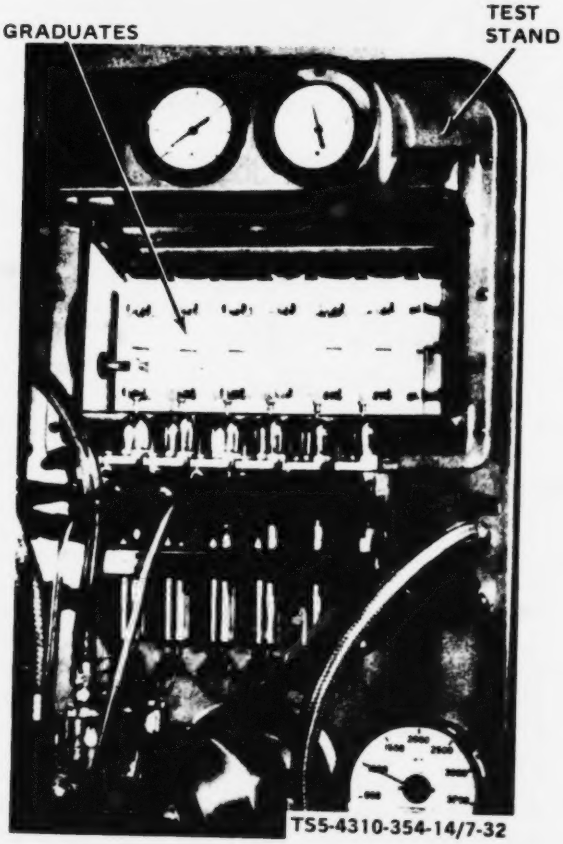


Figure 7-32. Test stand operation.

(9) Check and record full load fuel delivery and transfer pump pressure. Delivery should be 51-54 mm^3 per stroke and pressure of 70-75 psi.

(10) Check electrical shutoff with 12-vdc at wide open throttle, at 400 rpm, full load governed speed of 2200 rpm, and high idle (shutoff only) 2400 rpm.

NOTE

Do not attempt to check solenoid operation with cover removed from pump. The governor linkage spring aids operation when cover is assembled.

(11) Adjust test stand speed to 2400 rpm and adjust high idle screw.

(12) Set low idle at 600 rpm.

(13) Check the speed responsive automatic advance cam movement. Cam movement is 1 degree at 1100-1300 rpm and total movement of 6 degrees, plus or minus ½ degree, at 2100-2300 rpm.

(14) Assemble sealing wires to secure settings made, as necessary, at automatic advance, end plate cover screws, pump cover and governor spring guide screw and throttle shaft adjusting screw. Wire the throttle lever in "full fuel" position for storage or shipment of pump, ur until installed on engine.

f. Installation and Timing.

(1) If the engine crackshaft has not been turned since fuel injection pump removal, the engine flywheel timing mark of 20° before top dead center should be aligned for number 1 cylinder compression stroke. If crankshaft was turned, set the timing mark in accordance with para 7-8.*a*.(4).

CAUTION

Do not rotate the pump shaft backwards to align the internal timing marks. Always rotate it in the same direction as the engine crankshaft, when viewed from the front or timing gear end of the engine.

(2) Remove the timing hole cover plate from the injection pump. Turn the rotor in the direction of engine rotation so that the timing lines of the pump coincide as shown in figure 7-15. This times the pump so that it can be

positioned on the engine which has the crankshaft aligned to the proper timing position.

NOTE

If the fuel pump drive shaft has been removed, note that the shaft has a tang with an off-center drilled hole that aligns with a matching drilled hole in the distributor rotor. Check the alignment of these holes to assure correct installation.

(3) Install injection pump on mounting studs. Install flat washers, lock washers, and nuts on mounting studs finger tight only (figure 7-15).

(4) Install drive gear onto tapered end of injection pump shaft. Install lock washer and nut on pump shaft. Rotate pump shaft in rotation direction until timing marks are aligned (figure 7-15). Tighten shaft nut (table 1-1) and pump mounting nuts.

(5) Install thrust plate gasket and thrust plate on gear housing and secure with lock washers and cap screws (figure 7-15).

(6) Install pump timing cover plate and gasket on the pump.

(7) Connect wires to fuel pump solenoid terminals (figure 1-3). Connect speed control rod ball joint to pump throttle lever; secure with lock nut (figure 7-15).

(8) Remove fuel connection screws and washers from injection pump. Connect the fuel injection lines to the pump using the connection screws and a washer on each side of the fuel line connection. Tighten the connection screws (table 1-1). Install the other fuel line fittings. Connect the fuel leakoff line, fuel return hose, and fuel pickup hose (figure 7-15).

(9) Purge the system of air (figure 3-17); then, connect fuel pressure hose (figure 7-15).

(10) Install the radiator and oil cooler group (figure 4-18).

Section V. WATER PUMP AND FAN ASSEMBLY

7-9. General. The water pump assembly is a centrifugal-type pump mounted on the front of the engine. The water pump is driven by a single V-belt from a crankshaft-mounted drive pulley. The alternator is also driven by this V-belt with tension adjustment of the belt being made by moving the alternator away from or toward, the engine. The cooling fan is mounted on the water pump driven pulley. Engine coolant is drawn from the bottom of the radiator and into the pump. The pump forces the coolant through the passages in the cylinder block, around the cylinders, through the cylinder head passages, through the thermostat housing, and back into the top of the radiator.

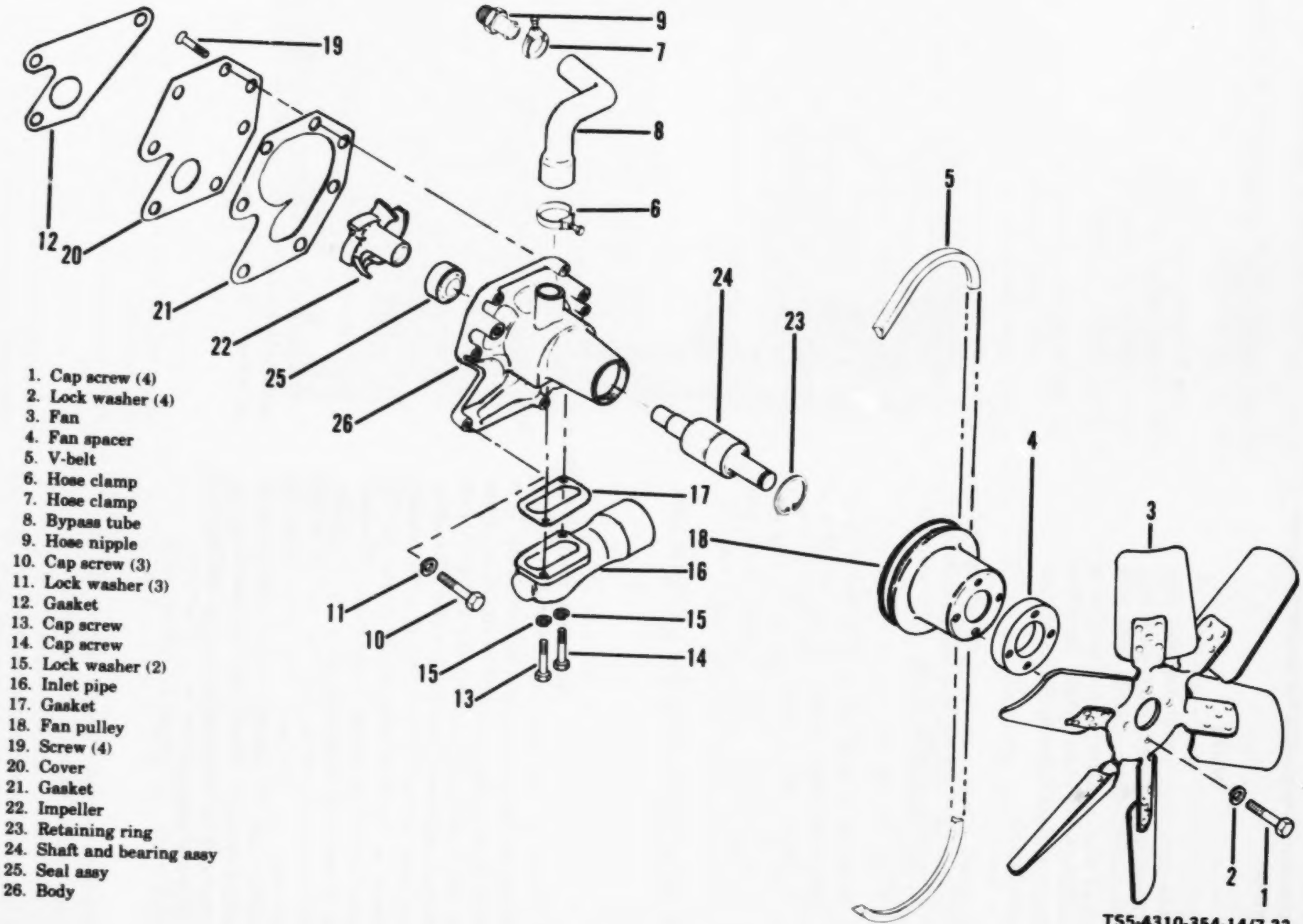
7-10. Water Pump and Fan Assembly.

a. Removal.

(1) Remove the radiator and oil cooler group (figure 4-18).

(2) Remove the water pump (figure 4-29).

b. Disassembly. Disassemble the water pump assembly in numerical sequence shown in figure 7-33 as follows. Discard gaskets and seal.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TS5-4310-354-14/7-33

1. Cap screw (4)
2. Lock washer (4)
3. Fan
4. Fan spacer
5. V-belt
6. Hose clamp
7. Hose clamp
8. Bypass tube
9. Hose nipple
10. Cap screw (3)
11. Lock washer (3)
12. Gasket
13. Cap screw
14. Cap screw
15. Lock washer (2)
16. Inlet pipe
17. Gasket
18. Fan pulley
19. Screw (4)
20. Cover
21. Gasket
22. Impeller
23. Retaining ring
24. Shaft and bearing assy
25. Seal assy
26. Body

Figure 7-33. Water pump and fan assembly, disassembly and reassembly.

(1) Disassemble the four cap screws (1) and lock washers (2), fan (3), fan spacer (4), and drive V-belt (5).

(2) Loosen hose clamps (6, 7) and disassemble bypass tube (8) and clamps (6, 7). Remove hose nipple (9) as necessary.

(3) Remove three cap screws (10) and lock washers (11). Tap water pump assembly with a soft mallet to loosen and remove the assembly and gasket (12).

(4) Disassemble cap screw (13), cap screw (14), two lock washers (15), inlet pipe (16), and gasket (17) from pump assembly. Pull fan pulley (18) off pump shaft.

(5) Disassemble the water pump assembly by removing four screws (19), cover (20), gasket (21), and retaining ring (23).

CAUTION

Place the front of pump body (26) on a support in an arbor press to press shaft and bearing assembly (24) out of pump body (26) and impeller.

(6) Press the shaft and bearing assembly (24) out of impeller (22) and pump body (26). Do not attempt to disassemble the shaft and bearing assembly (24) as this part is one unit. Press the seal assembly (25) out of pump body (26).

c. *Cleaning, Inspection, and Repair.*

(1) Clean all parts except shaft and bearing assembly (24) in accordance with paragraph 5-7*f*. Wipe the shaft and bearing assembly clean with a clean, lint-free cloth.

CAUTION

Do not attempt to straighten badly bent fan (3) blades. Straightening blades may weaken them, resulting in failure during operation.

(2) Inspect the fan (3) for cracks and for bent blades; replace if damaged.

(3) Inspect the fan pulley (18) for cracks and distortion. Check the pulley groove for rust and for rough spots. Clean up roughness or rust with fine emery cloth. Replace a worn or damaged pulley.

(4) Inspect the fan belt (5) for cracks, deterioration, fraying, and wear.

(5) Inspect the bypass tube (8) for cracks, dents, clogging, and other damage; replace a damaged bypass tube.

(6) Inspect the pump shaft and bearing assembly (24) for cracks, distortion, and signs of overheating. Check the bearings by rotating them on the shaft. If rough spots are detected, replace the shaft and bearing assembly.

(7) Inspect the impeller (22) for cracks, broken vanes, and wear. Replace a damaged impeller.

(8) Inspect the pump body (26) assembly and inlet pipe (16) for cracks and for worn or damaged threads. Replace if damaged beyond repair.

d. Reassembly. Reassemble the water pump and fan assembly in reverse numerical sequence shown in figure 7-33 and detailed instructions below.

(1) Press a new seal (25) into the pump body (26). Press only on the outer flange of the seal to avoid damaging the seal.

(2) Coat the seal surface of the shaft with grease and press the shaft and bearing assembly (24) into the body (26). Press only on the outer bearing race and not on the end of the shaft.

(3) After installing retaining ring (23), support the pump shaft on the outer shaft end and press the impeller (22) onto the shaft. There must be 0.010 inch (0.254 mm) clearance between the impeller (22) and a straightedge placed across the rear face of the pump body (26). See figure 7-34.

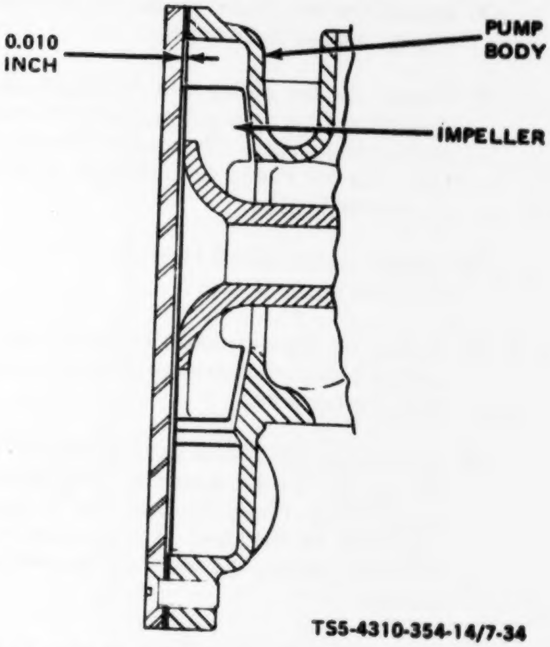

Figure 7-34. Water pump impeller, installation.

(4) Support the pump on the impeller end of the shaft and press the fan pulley (18, figure 7-33) onto the shaft.

(5) Install a new cover gasket (21), cover plate (20), and four screws (19). Stake the screws (19) securely.

(6) Reassemble gasket (17), inlet pipe (16), lock washers (15) and cap screws (14, 13). Install a new gasket (12) and attach pump assembly to engine with three lock washers (11) and cap screws (10).

(7) Reassemble hose nipple (9), place hose clamps (7, 6) on bypass tube (8), install the bypass tube (8) and tighten clamps (7, 6).

(8) Reassemble V-belt (5), fan spacer (4), fan (3), and attach fan with four lock washers (2) and cap screws (1).

e. *Installation.*

(1) Install the water pump (figure 4-29).

(2) Install the radiator and oil cooler group (figure 4-18).

(3) Service the radiator (figure 3-6).

(4) Adjust the drive belt (figure 4-5).

Section VI. ROCKER ARM, CYLINDER HEAD, AND VALVE ASSEMBLIES

7-11. **General.** The rocker arm assembly is mounted on top of the cylinder head to operate the intake and exhaust valves. The rocker arms are pivoted on the rocker arm shaft by the camshaft-operated push rods which engage one end of the rocker arms. As the rocker arms raise at one end, the opposite end pushes down on the ends of the valve stems to open the valves. In this manner, the valves control the intake and exhaust cycles of the engine. The rocker arms are pressure lubricated through an axial passage in the rocker arm shaft. The cylinder head is a one-piece casting which mounts the valves and rocker arms and provides inlet and outlet passage to and from the valves. The valve seats are formed as part of the casting. The valve guides are removable. The cylinder head contains cored passages for water flow to promote cooling of the head. The intake and exhaust valves operate in valve guides pressed into the cylinder head. They are held to their seats by springs which are secured to the valves by spring seats and valve locks. The valves are operated by conventional-type tappets with hollow pushrods running from the tappets to the rocker arms.

7-12. Rocker Arm Assembly.

a. Removal and Disassembly.

(1) Remove the lock nuts (1, figure 7-35) and washers (2, 3) that secure cylinder head cover (4). Remove the cover (4) and gasket (15).

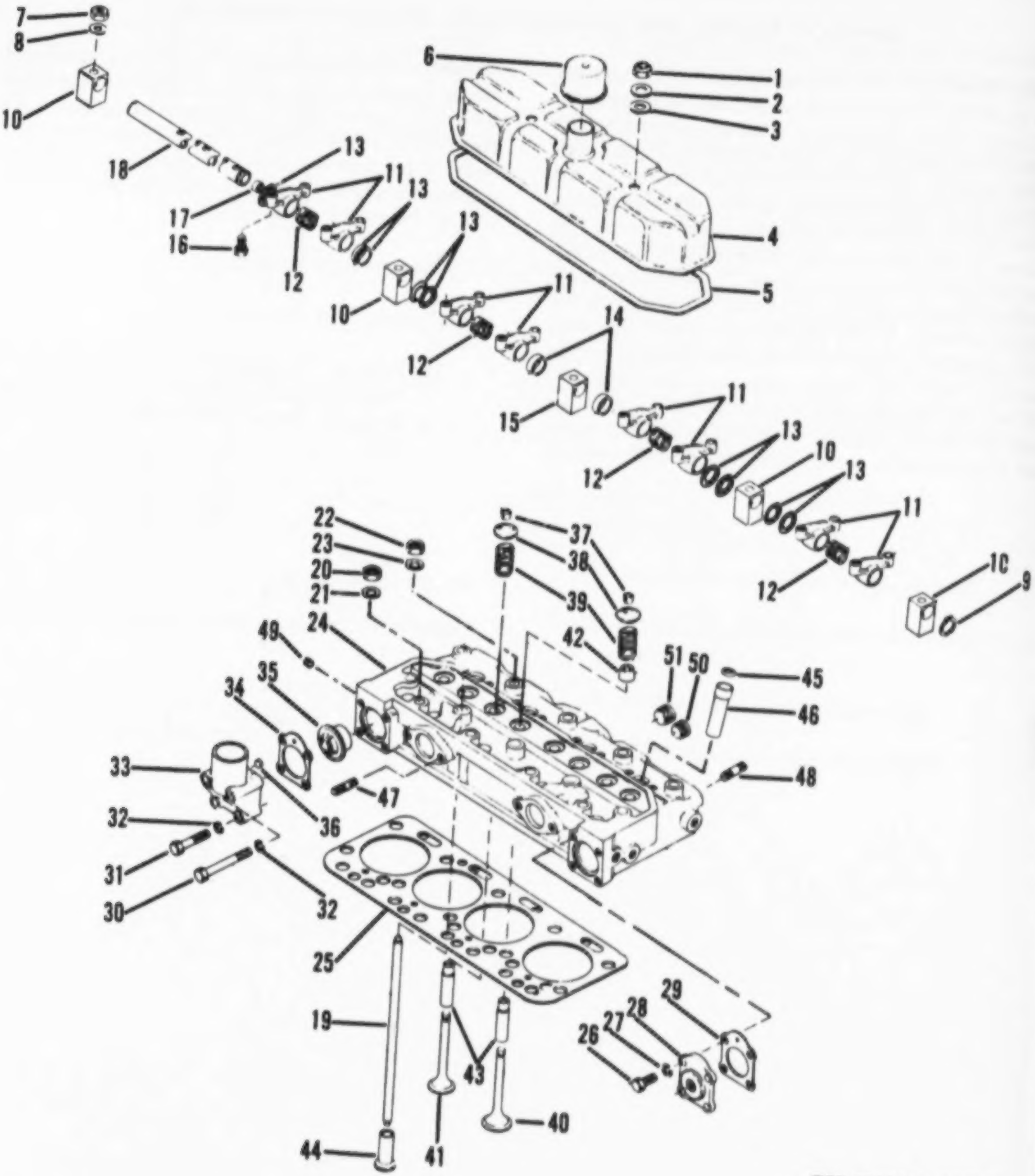
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Figure 7-35. Rocker arm, cylinder head, and valve assemblies, disassembly and reassembly

KEY to figure 7-35:
1. Lock nut (2)
2. Washer (2)
3. Washer (2)
4. Head cover
5. Gasket
6. Breather cap
7. Nut (5)
8. Lock washer (5)
9. Retaining ring (2)
0. Shaft support (4)
1. Rocker arm (8)
2. Spring (4)
3. Spacer (9)
4. Spacer (2)
5. Center shaft support
6. Adjusting screw (8)
7. Shaft plug (2)
8. Rocker arm shaft
9. Pushrod (8)
0. Nut (13)
1. Washer (13)
2. Nut
3. Washer
4. Cylinder head
5. Gasket
6. Cap screw (4)
27. Lock washer (4)
28. Cover
29. Gasket
30. Cap screw (2)
31. Cap screw (2)
32. Lock washer (4)
33. Thermostat housing
34. Gasket
35. Thermostat
36. Plug
37. Valve seat lock (16)
38. Valve spring seat (8)
39. Valve spring (8)
40. Intake valve (4)
41. Exhaust valve (4)
42. Intake valve stem seal (4)
43. Valve guide
44. Tappet (8)
45. Sleeve washer (4)
46. Nozzle holder sleeve (4)
47. Intake manifold stud (2)
48. Exhaust manifold stud (8)
49. Pipe plug
50. Pipe plug
51. Pipe plug

(2) Remove nuts (7) and washers (8) that secure the rocker arm shaft supports (10) to cylinder head (24). Carefully lift off the complete rocker arm assembly.

(3) Disassemble the rocker arm assembly in numerical sequence shown in figure 7-35, items 9 through 18, as follows:

(a) Remove the two retaining rings (9) from rocker arm shaft (18) ends.

(b) Slide the shaft supports (10), rocker arms (11), springs (12), spacers (13), spacers (14), and center shaft support (15) off of rocker arm shaft (18).

(c) Remove adjusting screws (16) from rocker arms (11). Remove shaft plugs (17) only as necessary.

b. *Cleaning, Inspection, and Repair.*

(1) Clean all parts in accordance with para 5-7*f*.

(2) Blow out the rocker arm lubricating passages with compressed air.

(3) Check the rocker arms (11) for cracks and surface imperfections by magnetic inspection.

(4) Check the spacer springs (12) for damaged ends and misaligned coils. A 10-pound (4.5 kg) load on the spring should compress it to 1 inch (25.4 mm). Replace a damaged or weak spring.

(5) Check the ball end of the rocker arm adjusting screw (16) and the rocker arm (11). Replace the screw (16) if flat on bottom or if there is evidence of scratching or wearing. If rocker arm contact surfaces are worn or damaged, replace with new rocker arm (11).

(6) Check for damaged threads on all adjusting screws (16) and rocker arms (11). The adjusting screws are self-locking and must take a minimum of 3 foot-pounds (0.42 kg-m) torque to turn into the rocker arms. Replace any loose-fitting adjusting screws.

(7) Check the rocker arms (11) for worn shaft bore diameter. The maximum allowable diameter is 0.8665 inch (22.0091 mm). Discard worn rocker arms if damaged or worn beyond this limit.

(8) Check rocker arm shaft (18) for wear or scoring. If shaft has shoulders or ridges due to rocker arm action on shaft, replace with new shaft. The rocker arm shaft diameter should not be worn to less than 0.8560 inch (21.7424 mm).

(9) Inspect the cylinder head cover (4) for cracks, dents, and distorted sealing area. Discard and replace if damaged. Make sure the breather screen is clean and in good condition and that the breather cap (6) fits securely on the cylinder head cover (4).

c. Reassembly and Installation.

CAUTION

The rocker arms are lubricated by means of oil forced through a hollow cylinder head stud into the rocker arm shaft (18). Oil is forced out through small holes in the rocker arms (11), over the valve (40, 41) stems and pushrods (19). For proper lubrication it is imperative that the rocker arm and shaft be correctly assembled and installed on the engine. Refer to figure 7-35 and the following paragraphs.

(1) Coat the rocker arm shaft (18) lightly with clean lubricating oil. Slide the shaft supports (15, 10), rocker arms (11), spacing springs (12), and spacers (13, 14) onto the rocker arm shaft (18). Install the spacers (13, 14) on the shaft as indicated in figure 7-36. Make certain that the oil holes in the shaft face downward and toward the camshaft side of the engine, as shown in figure 7-37. Rocker arms shown on figure 7-36 have only one oil hole which must be assembled downward. Install the retaining rings (9, figure 7-35) on each end of the rocker arm shaft (18). Install adjusting screws (16) in rocker arms (11).

(2) Before installing the rocker arm assembly on the cylinder head, check that rocker arms are properly installed and that they move freely on the shaft.

(3) Install the rocker arm assembly over the cylinder head stud extensions and seat it firmly on the cylinder head. Make certain the rocker arm adjusting screws (16) are positioned over the pushrods. Secure the rocker arm assembly to the cylinder head with nuts (7) and washers (8).

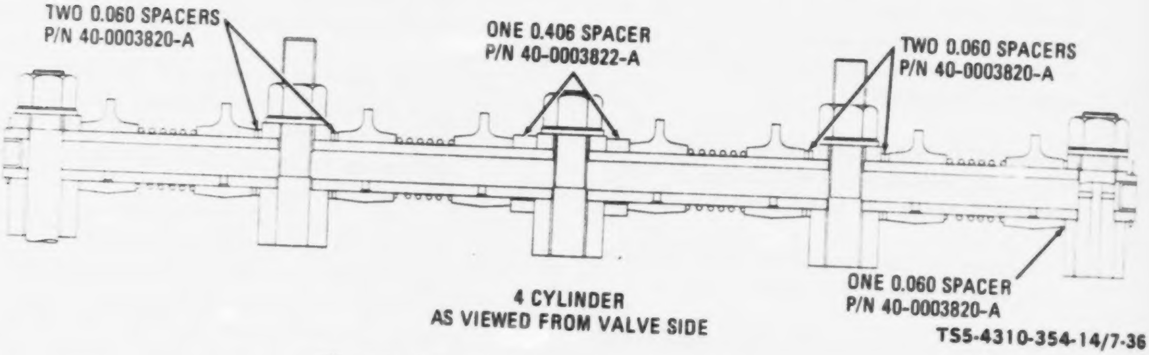
TWO 0.060 SPACERS
P/N 40-0003820-A
ONE 0.406 SPACER
P/N 40-0003822-A
TWO 0.060 SPACERS
P/N 40-0003820-A
4 CYLINDER
AS VIEWED FROM VALVE SIDE
ONE 0.060 SPACER
P/N 40-0003820-A

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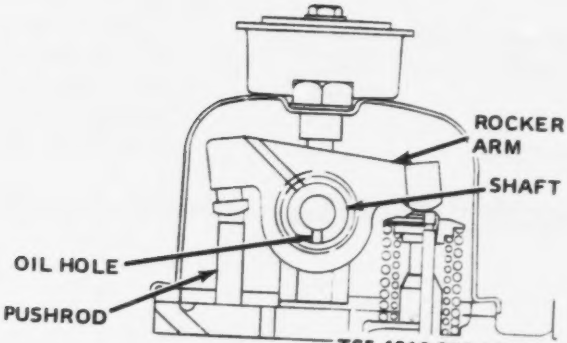
Figure 7-36. Rocker arm, spacer locations.


ROCKER
ARM
SHAFT
OIL HOLE
PUSHROD

TS5-4310-354-14/7-37

Figure 7-37. Rocker arm shaft, oil hole position.

(4) Adjust the valve clearance; refer to paragraph 4-50.*b*. and figure 4-32.

(5) Start the engine and warm up to operating temperatures. With the engine idling slowly, readjust the valve clearance; refer to para 4-50.*a*. and figure 4-32.

(6) Install the cylinder head cover (4, figure 7-35) and new gasket (5) and secure to cylinder head with nuts (1) and washers (2, 3).

(7) Install breather cap (6) on the cylinder head cover (4) if removed.

7-13. Cylinder Head Assembly and Valves.

a. Removal and Disassembly.

(1) Remove the exhaust muffler group (figure 4-9).

(2) Remove the exhaust manifold (figure 4-31).

(3) Remove the fuel injection lines (figure 4-28).

(4) Remove the fuel injection nozzles (figure 4-26).

(5) Remove the intake manifold (figure 4-30).

(6) Drain the radiator and remove the upper radiator hose (figure 4-3).

(7) Remove engine water temperature shutdown switch (figure 4-35).

(8) Remove engine water temperature sensing bulb from cylinder head (figure 4-34).

(9) Disconnect and remove bypass tube and nipple connecting water pump to cylinder head (figure 7-33).

(10) Remove enclosure components to the extent necessary to remove the cylinder head (figure 4-17).

(11) Disconnect instrument panel brace from cylinder head (figure 4-33).

(12) Remove cylinder head cover and the rocker arm assembly (para 7-12.*a*.). Lift out the pushrods (19, figure 7-35).

(13) Remove nuts (20, 22), washers (21, 23), lifting eyes, and spacers from cylinder head studs.

(14) Remove the cylinder head (24) and gasket (25) from the engine and disassemble in numerical sequence shown in figure 7-35, items 19 through 51, and the following:

NOTE

It may be necessary to tap the head with a soft hammer to loosen from cylinder block. Do not pry on the contact surfaces.

(a) Disassemble cap screws (26), lock washers (27), water outlet cover (28), and gasket (29).

(b) Disassemble cap screws (30, 31), lock washers (32), thermostat housing (33), gasket (34), and thermostat (35). Do not remove plug (36) unless replacement is necessary.

(c) Use a clamp-type spring compressor and compress valve springs (39). Remove valve seat locks (37), valve spring seats (38), valve springs (39), intake valves (40), and exhaust valves (41).

NOTE

Place intake valves (40) and exhaust valves (41) in a rack with holes numbered so that valves can be identified and reassembled in their respective positions.

(d) Remove intake valve stem seals (42). Press valve guides (43) out of cylinder head (24) only when necessary.

(e) The fuel injection nozzle sleeves (46) and washers (45) should not be removed unless replacement is necessary. Remove intake manifold studs (47), exhaust manifold studs (48) and pipe plugs (49, 50, 51) only when necessary to replace.

b. Cleaning, Inspection, and Repair.

NOTE

Before cleaning the cylinder head (24), inspect the cylinder head gasket (25) and cylinder head (24) for indications of gasket failure and leaking. If cylinder head gasket failure is apparent, make a thorough check of contributing factors. Detonation (caused by fuel pump being improperly timed or excessive use of ether for cold starting) will cause a shock load in the combustion chamber which will damage cylinder head gaskets and, if allowed to continue, may destroy the piston pins and piston rings. Fuel with a cetane rating too low may also contribute to detonation and corrosion of the gasket and may eventually cause leaking. Cooling solutions which are contaminated by corrosive combustion gases leaking into the cooling system are very detrimental to the internal parts of the entire cooling system.

(1) Remove all carbon from combustion areas using a scraper and wire brush.

(2) Discard and replace all gaskets.

(3) Clean all parts in accordance with para 5-7*.f*.

(4) Make sure that gasket contact surfaces on the cylinder head, and the cylinder block, are clean, smooth, and flat. Rework contact surfaces, as necessary, to assure that they are free of erosion, pits, burrs, scratches, or any other defect.

(5) Check out-of-flatness with straight edge and feeler gauge; maximum allowable is 0.005 inch (0.127 mm) on width or length. Out-of-flatness should vary gradually and uniformly from end to end and side to side. Resurface the cylinder head as necessary by light sanding with an orbital sander.

(6) Check for free water flow through the cylinder head. If restriction is evident, remove plugs (49, 50, 51) and fuel nozzle holder sleeves (46); clean water jackets of salt, lime, or sludge by submerging cylinder head into a tank of heated cleaning solution. Circulate the cleaning solution. When clean, remove cylinder head from tank and dry with compressed air.

(7) Inspect for loose or damaged fuel nozzle holder sleeves (46). If necessary, pull out the sleeves and press in new ones. To pull the sleeves, it may be necessary to thread the inner diameter to provide a pulling surface.

(8) Water-test the cylinder head for cracks and leaks. Check for cracks in the valve and fuel nozzle holder sleeve areas using magnetic detection.

(9) Clean all carbon from valves using suitable scraping or buffing tools.

(10) Clean the valve guides (43). Remove lacquer or other deposits by running a valve cleaner or wire brush through the guides. Inspect the valve guides (43) for excessive wear. The exhaust valve guides will usually show the most wear. The maximum allowable bore diameter of the intake valve guides is 0.3780 inch (9.6012 mm). The maximum allowable bore diameter of the exhaust valve guide is 0.3790 inch (9.6266 mm). (See table 5-2.)

(11) Inspect the valve seats. If they are pitted, or if new valve guides will be installed, the seats must be refinished.

(12) Inspect the valves (40, 41) carefully. If the stems are bent or badly worn or if the valves are deeply pitted, the valves must be replaced by new ones. Valves that are only slightly pitted can be used by refacing them on a valve grinder. Exhaust valves must have an accurately finished 30-degree face angle and intake valves a 45-degree face angle.

(13) If the valve guides (43) are excessively worn and require replacing, it must be done before any refinishing is done on the valve seats. This will ensure that the seat being finished is square with respect to the new guide. To drive out the guides, use a drift with a ⅝-inch (15.875 mm) diameter and a ⅜-inch (9.525 mm) diameter pilot. Drive in the new guides so that the dimension from

the lower edge of the valve guide to the gasket face of the cylinder head is 1.3800 inches (35.042 mm). See figure 7-38. After the new guides are driven in, ream the inside diameter to correct any squeezing in or any distortion. Ream the exhaust valve guides to 0.3750 to 0.3760 inch (9.525 to 9.550 mm). Ream the intake valve guide to 0.3740 to 0.3750 inch (9.4996 to 9.5250 mm).

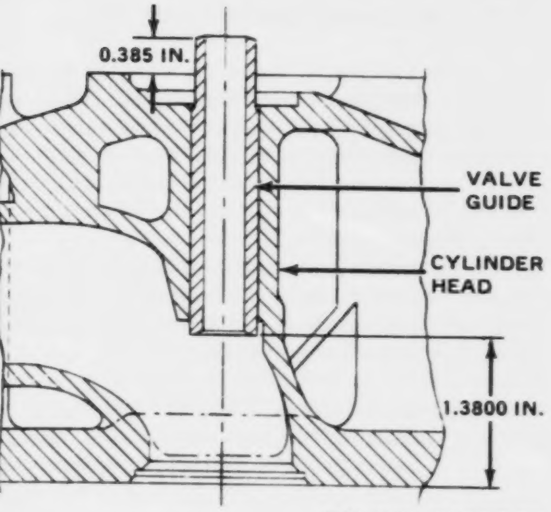


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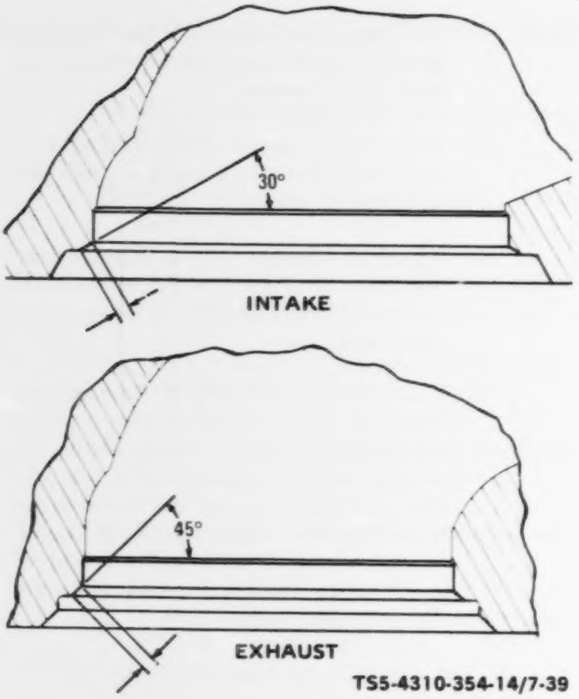
Figure 7-38. Valve guide, installation.

(14) If the valve seats are pitted or if new valve guides have been installed, the seats must be refinished. The intake valve seats are finished on a 30-degree angle and the exhaust valve seats are finished on a 45-degree angle. Use a vibrating angle grinder-type reseating tool with a ⅜-inch (9.525 mm) diameter pilot. Lightly lubricate and install the pilot into the valve guide bore. Lower the grinder head over the pilot shank until the stone just clears the valve seat. Turn on the power and gently allow the stone to contact the valve seat. Very little pressure other than the weight of the stone should be used. Grind the seat sufficiently to remove shoulders and pits, and to provide an even, smooth surface. Do not grind any deeper than necessary. The finished valve seat should contact the approximate center of the valve face. Refer to figure 7-39.



TS5-4310-354-14/7-39

Figure 7-39. Valve reseating dimensions.

(15) *Seating Valves.* If the valves and seats are not deeply pitted or shouldered or have been refaced, grind or lap each valve to its seat as follows:

(a) Lubricate the valve stem and apply a thin coating of good quality, medium coarse grinding compound on the valve face.

(b) Take a light coil spring with enough tension to just hold the valve off the seat and insert it over the valve stem. Insert the valve in the valve guide.

(c) Use a reciprocating grinding tool and rotate the valve a few times, pressing firmly on the grinding tool. (Avoid using a grinding tool with a continuous circular motion that will cut grooves in the valves or seat.) Release the pressure on the tool and allow the spring to lift the valve from its seat. Rotate the valve 15 or 20 degrees and repeat the grinding process. Periodically wipe off valve and seat and inspect the seating progress. Reapply another thin coating of compound and continue grinding until inspection shows the surfaces are in contact.

(d) Wipe off all heavy compound, apply a thin coating of fine compound, and continue the grinding.

(e) When the surfaces show a bright, silver-like band of uniform width on both the valve and seat, clean off all traces of the compound.

(f) Test each valve for a tight fit as follows: Make 10 or 12 pencil marks, equally spaced, across the valve seat. Firmly rotate the valve in the seat for a part of a turn and again lift out the valve to observe if all the pencil marks are rubbed out on the contact surface. If not, regrind until this test shows a gas-tight mating of the valve and seat.

(16) Test the valve springs (39, figure 7-35) as follows:

(a) Check the free length of the valve springs, intake and exhaust. The free length should be 1.796 to 1.836 inches (45.62 to 46.63 mm).

(b) Apply a test load of 72 to 82 pounds (32.66 to 37.20 kg). Check the length of the springs under this test load. Length should be 1.492 inches (37.90 mm).

(c) Increase the test load to 163 to 180 pounds (73.94 to 81.65 kg). Length of springs should be 1.082 inches (27.48 mm).

(d) Valve springs that do not meet the above specifications shall be replaced.

(17) Inspect all other parts for cracks, distortion, damaged threads, and other damage. Replace any damaged parts.

c. Reassembly and Installation. Reassemble the cylinder head assembly and valves in reverse numerical sequence shown in figure 7-35, items 51 through 19, and the following:

NOTE

Make certain that the valves are reinstalled in the same position from which they were removed. If valves were reground, it is imperative that the valves be assembled in the same seats to which they were ground.

(*1*) *Valves.* Reassemble the valves (40, 41) in the cylinder head (24) as follows:

(a) Thoroughly clean all traces of grinding compound from the valves, stems, and guides. Lubricate the valve stems with a few drops of engine oil and insert the valves in the same holes from which they were removed.

(b) Insert the intake valve stem seals (42) over the ends on the intake valves (40) and secure firmly on the exposed ends of the valve guides (43).

(c) Install the valve springs (39) and spring seats (38) on the valve stems. Using a valve spring compressor, compress the valve springs (39) and install the valve locks (37).

(d) Turn the head on the exhaust manifold side and pour solvent in the intake openings. If solvent seeps out around any valve, remove that valve and regrind it. Repeat the test, pouring solvent in the exhaust opening. If any exhaust valve leaks, regrind it.

(e) When assured of gas-tight valve seating, assemble the remaining components of the cylinder head assembly.

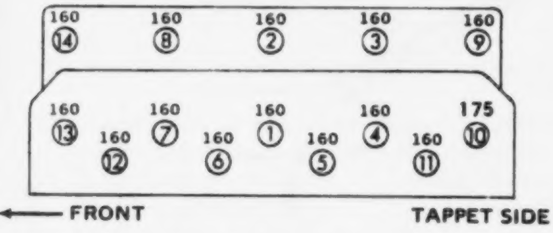
(f) Make certain plug (36) is installed, if removed at disassembly. Reassemble thermostat (35), gasket (34), thermostat housing (33), and attach with lock washers (32) and cap screws (31, 30).

(g) Reassemble gasket (29), water outlet cover (28), and attach with lock washers (27) and cap screws (26). Check that pipe plugs (49, 50, 51) are installed in head. If removed, install studs (47, 48).

(2) *Cylinder head assembly.* Make sure the cylinder block contact surface is clean of carbon deposits. Install a new cylinder head gasket (25) on the cylinder block. The gasket (25) must be assembled with the bead (rolled edge around the combustion chamber) down. For sealing, use any good cylinder head gasket cement. Proceed with installation as follows:

(a) Place the cylinder head assembly (24) on the block. Be careful not to damage contact surfaces or the cylinder head studs.

(b) Install the cylinder head nuts (20, 22) and washers (21, 23). Tighten evenly, working from the center of the head outward. Refer to figure 7-40 for tightening sequence, torque, and procedure for tightening cylinder head to cylinder block. Tighten all nuts first to 75 foot-pounds (10.3725 kg-m) torque in the sequence indicated, then 125 foot-pounds (17.2875 kg-m) torque and so forth.



TORQUE VALUES ARE GIVEN DIRECTLY OVER STUD LOCATIONS.

TS5-4310-354-14/7-40

Figure 7-40. Cylinder head nuts, tightening sequence and torque values.

CAUTION

The cylinder head nuts must be retightened and the valve clearance reset after 1 hour of service.

(c) Install the valve pushrods (19, figure 7-35).

(d) Install the rocker arm assembly (para 7-12.*c*).

(e) Adjust the valve clearance (para 4-50.*b*. and 4-50.*c*.).

(f) Connect instrument panel brace to cylinder head (figure 4-33).

(g) Install enclosure components as necessary (figure 4-17).

(h) Install bypass tube nipple and connect bypass tube (figure 7-33).

(i) Install water temperature sensing bulb (figure 4-34).

(j) Install engine water temperature shutdown switch (figure 4-35).

(k) Install upper radiator hose and service the radiator (figure 4-3).

(l) Install intake manifold (figure 4-30).

(m) Install fuel injection nozzles (figure 4-26).

(n) Install fuel injection lines (figure 4-28).

(o) Install exhaust manifold (figure 4-31).

(p) Install exhaust muffler group (figure 4-9).

(q) Start the engine and allow to run until operating temperature is reached. Recheck and adjust valve clearance (para 4-50.*a*.).

(r) Install cylinder head cover. Install spacers, lifting eyes, and secure lifting eyes with nuts.

Section VII. OIL PAN AND OIL PUMP ASSEMBLY

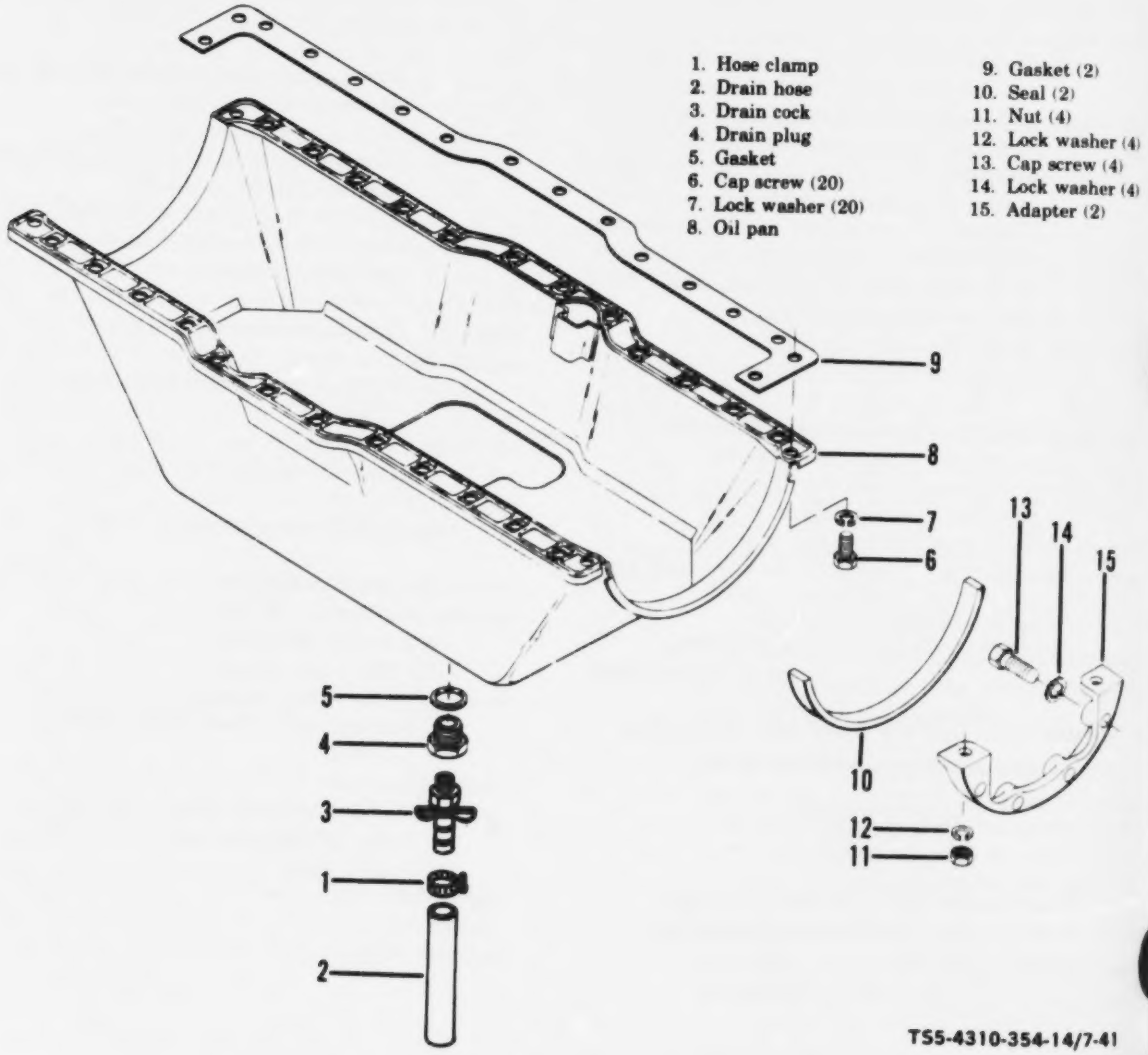
7-14. General. The oil pan serves as a cover for the bottom of the crankcase and as an oil reservoir. The oil pump is attached to the side of the cylinder block with the lower end extending into the oil pan. The oil is drawn into the pump through a large screen which prevents coarse dirt from entering the pump. The pump requires no priming and is driven by a gear that engages a toothed portion of the camshaft, located near the center of the camshaft.

7-15. Oil Pan.

a. Removal.

(1) Remove the engine from the unit (para 5-12.*a*. and figure 5-7).

(2) Open drain cock (3, figure 7-41) and drain oil into a suitable container.



1. Hose clamp
2. Drain hose
3. Drain cock
4. Drain plug
5. Gasket
6. Cap screw (20)
7. Lock washer (20)
8. Oil pan
9. Gasket (2)
10. Seal (2)
11. Nut (4)
12. Lock washer (4)
13. Cap screw (4)
14. Lock washer (4)
15. Adapter (2)

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Figure 7-41. Oil pan and adapters, removal and installation.

(3) Remove the starting motor assembly (figure 4-24).

(4) Support the oil pan and remove in numerical sequence shown in figure 7-41 as follows:

(a) Loosen hose clamp (1) and remove drain hose (2) and clamp (1). Remove drain cock (3), drain plug (4), and gasket (5).

(b) Remove twenty attaching cap screws (6) and lock washers (7). Separate the oil pan (8) from cylinder block and remove gaskets (9). Remove front and rear seals (10).

(c) Only when necessary for replacement, remove nuts (11) and lock washers (12) from cylinder block studs. Remove cap screws (13), lock washers (14), and the two (front and rear) adapters (15).

b. *Cleaning and Inspection.*

(1) Discard all gaskets (9) and seals (10). Make sure the gasket mounting surfaces on the oil pan, cylinder block, and oil pan adapters are clean and free from burrs.

(2) Steam-clean pan (8) and all mounting parts.

(3) Inspect the oil pan (8) for distortion, dents, and cracks. Check for signs of leakage. Repair small cracks in pan by welding. Do not weld finished surfaces.

(4) Check threaded holes and cap screws for damaged threads.

c. *Installation.*

(1) Before installing the oil pan, inspect the inside of the engine for loose nuts, screws, cotter pins, and lock wires; tighten or replace as necessary.

(2) Install the oil pan in reverse numerical sequence shown in figure 7-41 as follows:

(a) If removed, install front and rear adapters (15) onto cylinder block studs and attach with lock washers (12), nuts (11), lock washers (14) and cap screws (13).

(b) Remove all gasket particles from gasket mounting surface before applying new gasket. Cement the new oil pan side gaskets (9) to the cylinder block using shellac, or equivalent.

(c) Remove protective coverings from oil pan adapter seals (10) and apply seals (10) to adapters (15). Make sure both ends of the seal contact the pan gaskets on each side. Seal surfaces on adapters (15) must be free of oil and dirt.

(d) Put the oil pan (8) in place and carefully start all the cap screws. Be sure the lock washers (7) are on the cap screws (6). Tighten all cap screws evenly and progressively. This will allow the oil pan to center on the adapter blocks. Do not overtighten oil pan cap screws (see table 1-1).

(e) Install gasket (5), drain plug (4), and drain cock (3). Attach drain hose (2) to drain cock (3) with hose clamp (1).

(3) Install the starting motor assembly (figure 4-24).

(4) Install the engine (para 5-12.*b*. and figure 5-7).

(5) Fill crankcase with proper grade and amount of lubricating oil (LO 5-4310-354-12, figure 3-1).

7-16. Oil Pump.

a. *Removal and Disassembly.*

(1) Remove the oil pan (para 7-15.*a*.).

(2) Remove tachometer drive and overspeed switch drive as shown in figure 7-42.

TACHOMETER DRIVE CABLE
CAP SCREW
CLAMP
CAP SCREW (2)
ADAPTER
O-RING
DRIVE SHAFT
GASKET
OVERSPEED TRANSMITTER
ADAPTER SHAFT ASSEMBLY

TS5-4310-354-14/7-42

REMOVAL

STEP 1. DISCONNECT TACHOMETER DRIVE CABLE. REMOVE CAP SCREW AND ADAPTER CLAMP.

STEP 2. REMOVE ADAPTER AND O-RING. REMOVE TACHOMETER DRIVE SHAFT ASSEMBLY.

STEP 3. REMOVE OVERSPEED SWITCH TRANSMITTER FROM ADAPTER.

STEP 4. REMOVE CAP SCREWS, ADAPTER, AND GASKET. REMOVE OVERSPEED DRIVE GEAR AND SHAFT ASSEMBLY.

INSTALLATION

STEP 1. INSTALL OVERSPEED DRIVE GEAR AND SHAFT ASSEMBLY. USE A NEW GASKET AND INSTALL GASKET AND ADAPTER. SECURE WITH CAP SCREWS.

STEP 2. INSTALL THE OVERSPEED TRANSMITTER ON ADAPTER.

STEP 3. INSTALL TACHOMETER DRIVE SHAFT ASSEMBLY. USE A NEW O-RING AND INSTALL O-RING AND ADAPTER.

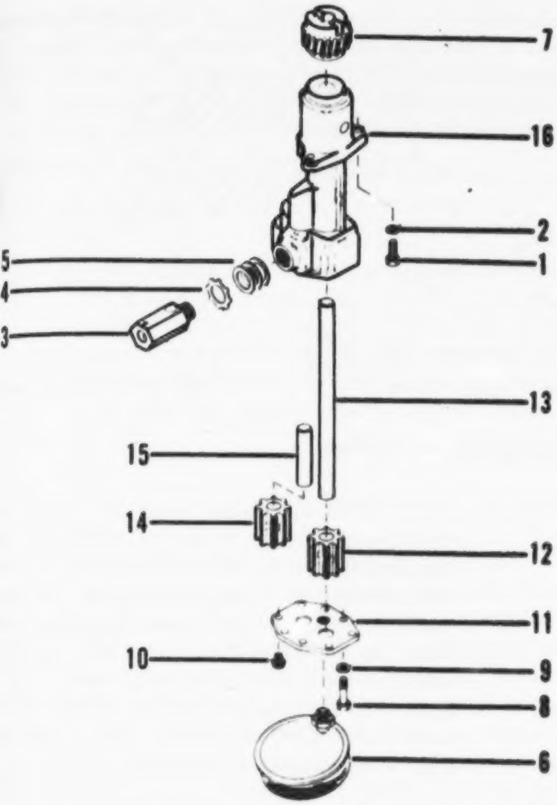
STEP 4. INSTALL ADAPTER CLAMP AND SECURE WITH CAP SCREW. CONNECT TACHOMETER DRIVE CABLE.

Figure 7-42. Tachometer drive and overspeed switch drive, removal and installation.

(3) Turn the engine crankshaft so that number 1 or 4 piston is in the firing position. In this position the piston assembly is fully extended above the crankshaft.

(4) Remove cap screws (1, figure 7-43) and lock washers (2) that attach the oil pump and remove the oil pump.

(5) Disassemble oil pump in numerical sequence shown in figure 7-43 as follows:



TS5-4310-354-14/7-43

1. Cap screw (2)
2. Lock washer (2)
3. Regulator
4. Lock washer
5. Shims (AR)
6. Strainer
7. Drive gear
8. Cap screw (2)
9. Lock washer (2)
10. Screw assy (6)
11. Cover
12. Drive impeller
13. Drive shaft
14. Idler impeller
15. Idler shaft
16. Pump body

Figure 7-43. Oil pump assembly, disassembly and reassembly.

(a) Remove the strainer (6) from cover (11). Bend up tangs of lock washer (4) and remove regulator (3), lock washer (4), and shims (5). Do not disassemble regulator (3).

(b) Use a gear puller to remove drive gear (7) from shaft (13). Remove the two cap screws (8) and lock washers (9), six screw assemblies (10), and cover (11).

(c) Remove drive impeller (12) and shaft (13) as an assembly. If necessary, press impeller (12) off shaft (13).

(d) Remove impeller (14) from shaft (15). Shaft (15) is a press fit into body (16). Pull the shaft (15) from body (16) only when necessary.

b. Cleaning, Inspection, and Repair.

(1) Clean all parts in accordance with para 5-7*f*.

(2) Inspect the oil pump strainer (6) for clogged screen, holes, damaged threads, dents, or other damage. Make sure the oil passage is clear and unobstructed. Replace a damaged or distorted strainer.

(3) Inspect all gears (7, 12, 14) for worn or broken teeth; replace if damaged.

(4) Inspect all parts for burrs, pitting, rust, scoring, cracks, breaks, and damaged threads. Replace any damaged parts.

(5) Replace idler shaft (15) if shaft has turned in pump body (16) or is worn smaller than 0.6220 inch (15.7988 mm) diameter at gear bearing area.

(6) Replace drive shaft (13) if shaft has turned in gears or is worn smaller than 0.6220 inch (15.7988 mm) diameter at bearing points.

(7) Check piston for binding in regulator body; replace regulator (3) if piston binds.

c. Reassembly.

(1) Press drive impeller (12, figure 7-43) onto the drive shaft (13) so that the outside face of the impeller and the end of the shaft are flush. Once removed, do not press old parts back together.

(2) Insert the shaft and impeller assembly into the pump body (16). Press the drive gear (7) onto the shaft (12). Replace gear that can be pressed onto the shaft with less than 35 pounds (15.876 kg) gauge pressure. Press the gear onto the shaft to the dimensions shown in figure 7-44.

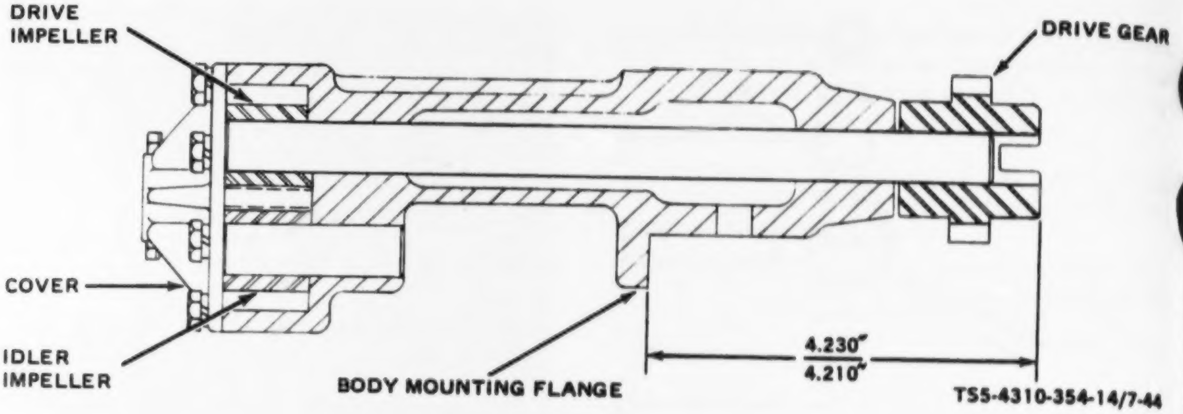

DRIVE IMPELLER
DRIVE GEAR
COVER
IDLER IMPELLER
BODY MOUNTING FLANGE
4.230"
4.210"
TS5-4310-354-14/7-44

Figure 7-44. Oil pump drive gear, installation.

(3) Install the idler shaft (15, figure 7-43), if removed, and install the idler impeller (14).

(4) Install the cover (11) and secure with cap screws (8), lock washers (9), and screw assemblies (10). Tighten progressively and evenly.

(5) Install the oil pump strainer (6) on the pump impeller cover (11) by turning in clockwise. Do not apply force against the screen.

(6) Install the oil pressure regulator (3) with a new lock washer (4). The regulator, when mounted on the pump, must be turned so that the relief hole is aligned within 30° of horizontal (see figure 7-45). This position will prevent oil from spraying up into the cylinder bore, and will direct the spray toward the center of the engine and against the oil pan surface. If the oil pressure regulator is in an incorrect position when tightened, add shims (5, figure 7-43) until the proper alignment is achieved.

d. Testing. Bench test the oil pump assembly on a suitable test fixture that is capable of turning the drive gear at 250 rpm. The setup should have an oil

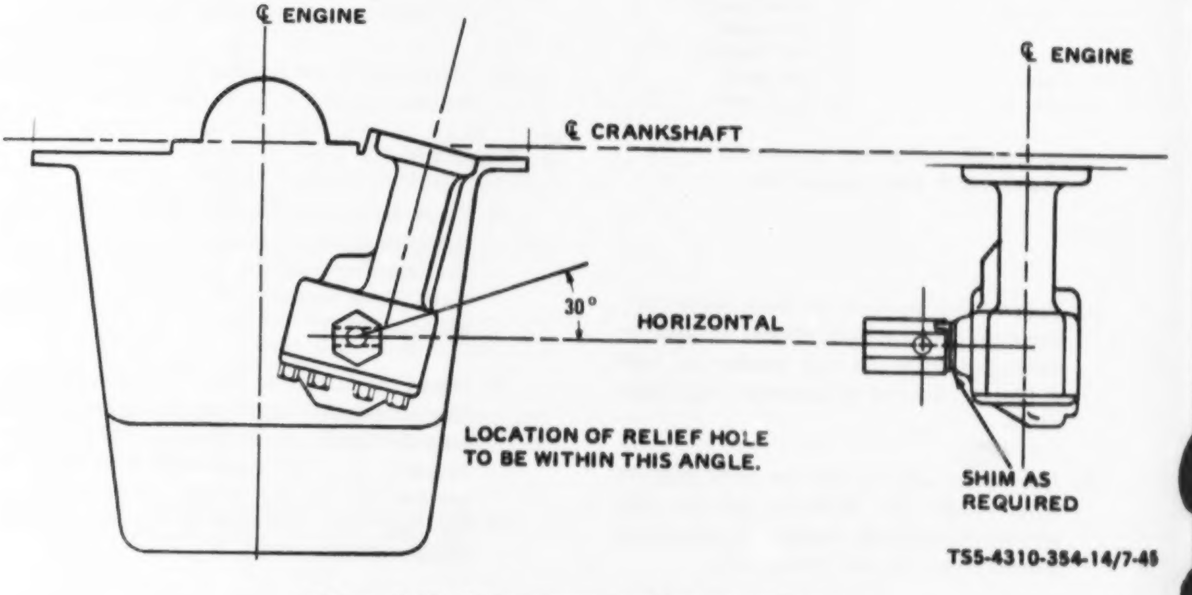

℄ ENGINE
℄ CRANKSHAFT
℄ ENGINE
30°
HORIZONTAL
LOCATION OF RELIEF HOLE TO BE WITHIN THIS ANGLE.
SHIM AS REQUIRED
TS5-4310-354-14/7-45

Figure 7-45. Oil pressure regulator, installation.

reservoir in which the strainer can be immersed and a pressure gauge to record pump output pressure. Fill the reservoir with clean engine oil (figure 3-1) heated to temperature of 170°F (77°C), immerse strainer, run oil pump at 250 rpm and observe output pressure. Minimum acceptable pressure is 10 psi.

e. Installation.

(1) When installing the oil pump assembly into the cylinder block, make certain that the arrow on the top side of the oil pump drive gear (7, figure 7-43) is aligned with the arrow stamped on the cylinder block attaching pad. The position of the arrows are the same when timing to cylinder number one or four at top dead center. Secure the oil pump assembly to cylinder block attaching pad with two lockwashers (2) and cap screws (1). Tighten cap screws (1) to 25 ft-lb (3.46 kg-m).

(2) Refer to figure 7-45 and check position of oil relief hole. Add shims (5, figure 7-43) as necessary to achieve proper alignment.

(3) Install overspeed switch drive and tachometer drive as shown in figure 7-42.

(4) Install the oil pan (para 7-15.*c*.).

Section VIII. FLYWHEEL AND BELLHOUSING

7-17. General. The flywheel is attached to the rear end of the crankshaft and is marked with a line and letters DC (dead center) for engine timing. From this DC line are also marked graduations designating degrees of crankshaft travel. These timing marks are visible through an opening in the bellhousing. A ring gear is pressed onto the flywheel. The ring gear is engaged by the starting motor pinion when cranking the engine. The bellhousing is mounted against the rear of the engine block and provides a cover for the flywheel. The bellhousing also serves as a support for the starting motor assembly and mounting of the air compressor assembly. The air compressor assembly is driven by a direct-drive type coupling that engages with the flywheel. The bellhousing also serves as the rear engine support.

7-18. Flywheel and Bellhousing.

a. Removal and Disassembly.

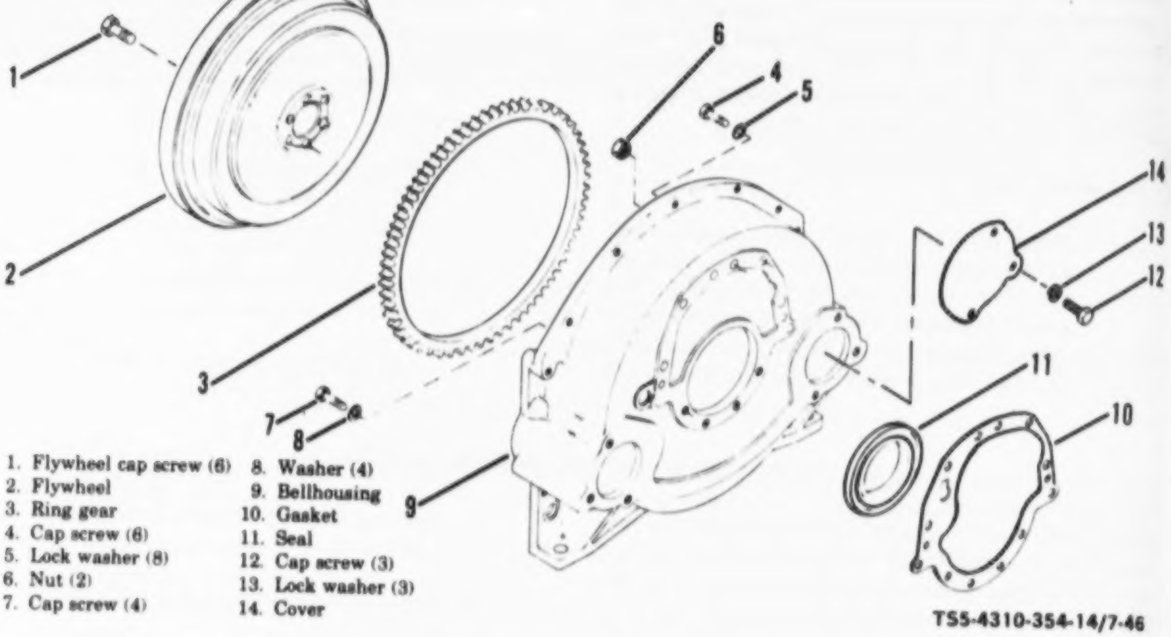
(1) Remove the engine from unit (para 5-12.*a*. and figure 5-7).

(2) Remove the starting motor assembly (figure 4-24).

CAUTION

When removing and installing the flywheel, use a suitable lifting device and lifting tool, as the flywheel is heavy.

(3) Remove the cap screws (1) that secure the flywheel (2) to the crankshaft. Using a prybar, remove the flywheel from the crankshaft (figure 7-46).



1. Flywheel cap screw (6)
2. Flywheel
3. Ring gear
4. Cap screw (6)
5. Lock washer (8)
6. Nut (2)
7. Cap screw (4)
8. Washer (4)
9. Bellhousing
10. Gasket
11. Seal
12. Cap screw (3)
13. Lock washer (3)
14. Cover

Figure 7-46. Flywheel and bellhousing, disassembly and reassembly.

(4) Do not attempt to remove ring gear (3) from flywheel (2) unless it is damaged and must be replaced.

(5) Remove the oil pan (para 7-15).

(6) Remove rear oil pan adapter (figure 7-41) by first removing two nuts and lock washers securing adapter to cylinder block studs; then, remove four cap screws and lock washers securing adapter to the bellhousing (9, figure 7-46).

(7) Remove cap screws (4, 7), washers (5, 8) and nuts (6). Separate bellhousing (9) from cylinder block and remove gasket (10).

(8) Press seal (11) out of bellhousing (9). Remove cap screws (12), lock washers (13), and cover (14) from bellhousing (9).

b. Cleaning, Inspection, and Repair.

(1) Clean all parts in accordance with paragraph 5-7*f*.

(2) Inspect the flywheel ring gear (3) for broken or cracked teeth. If damage is evident and replacement is necessary, drive the gear (3) from flywheel (2) with a blunt chisel.

(3) Inspect the flywheel (2) for distortion, cracks, or other damage or wear. Replace a damaged flywheel.

(4) To install a new ring gear (3), heat it in an oven or with a heating torch to approximately 600°F (315.6°C). Do not overheat. Place heated ring gear on flywheel (2) and quickly drive onto flywheel until gear is firmly seated.

(5) Discard and replace gasket (10) and oil seal (11). Make sure all gasket material is removed from mating surfaces.

(6) Inspect the bellhousing (9) for cracks, distortion, and other damage; replace a damaged bellhousing.

(7) Check that bellhousing dowel pins in the block are tight and in good condition.

c. Reassembly and Installation.

(1) Install a new oil seal (11, figure 7-46) in the bellhousing (9), using a small amount of sealing compound in the bore before pressing in the seal. If new seal is pre-coated, sealing compound is not required. Cement a new gasket (10) to the bellhousing (9), allowing the cement to dry sufficiently to prevent the gasket from slipping at installation.

(2) Clean and polish the oil seal surface of the crankshaft to remove nicks or scratches. Use crocus cloth or very fine polishing cloth.

(3) Apply a thin coat of oil soap to the seal and the seal surface of the crankshaft. If seal is already oil treated, additional lubricant is not required; however, take care to keep the seal surface clean during reassembly. Make sure that the top rear cam thrust plate attaching screw hole is plugged with a setscrew. This hole runs into an oil hole in the block. Carefully place the bellhousing (9) on the cylinder block so that the seal is not damaged as it engages the crankshaft. Align so that the dowels properly enter their respective holes. Seat the bellhousing (9) to the engine and install the cap screws (4, 7), nuts (6), and lock washers (5, 8) but do not tighten.

(4) Install the rear oil pan adapter (figure 7-41), securing it to the cylinder block with two nuts and lock washers. Secure the adapter to the bellhousing with four bolts and lock washers. Tighten down the bellhousing cap screws and nuts evenly and securely.

(5) Install the oil pan (para 7-15).

(6) Turn the crankshaft so that the timing cylinder (No. 1) is in the top dead center position.

(7) Turn the flywheel (2, figure 7-46) so that the DC timing mark is in line with the timing hole in the bellhousing (9). Install the flywheel (2) on the crankshaft. Note that one of the six cap screws (1) is off center so that the flywheel (2) can only be installed in one position. This ensures proper location of the flywheel on the crankshaft for timing purposes. Draw the flywheel onto the crankshaft by tightening the six cap screws alternately and evenly. Torque the bolts to 80 foot-pounds (11.064 kg-m).

(8) Attach an indicator, as shown in figure 7-47, to check the concentricity of the pilot bore. This should not exceed 0.005 inch (0.127 mm) total indicator reading.

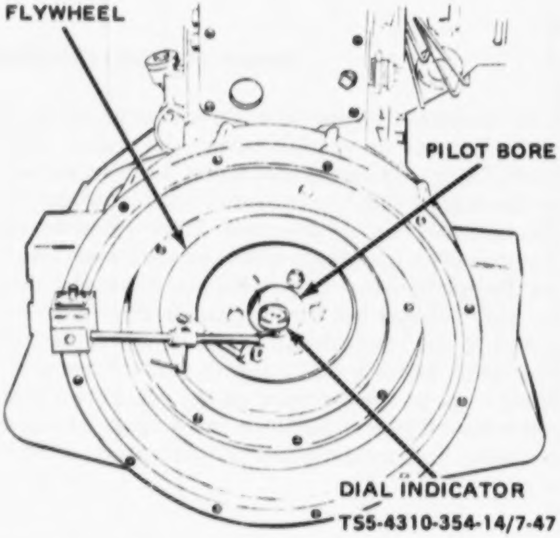


Figure 7-47. Indicating flywheel pilot bore.

(9) Attach the indicator, as shown in figure 7-48, to check the face of the flywheel. Run-

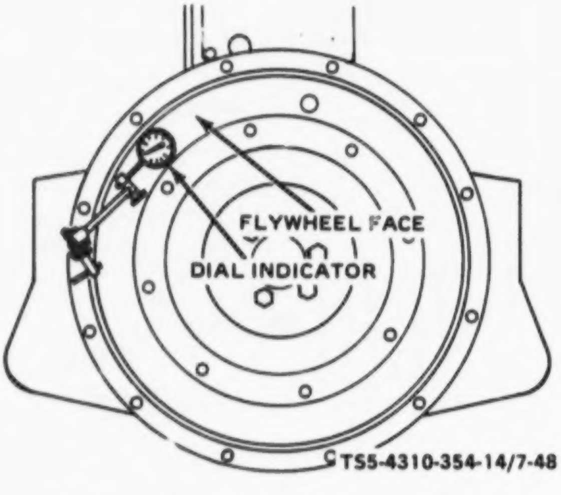


Figure 7-48. Indicating flywheel face.

out should not exceed 0.008 inch (0.2032 mm) total indicator reading. If runout is excessive, remove the flywheel and check for dirt or foreign matter between the flywheel and mounting seat on the crankshaft. Reinstall and recheck.

(10) Install the lock wires (if used) on cap screws (1, figure 7-46).

(11) Install cover (14), lock washers (13), and cap screws (12).

(12) Install the starting motor assembly (figure 4-24).

(13) Install the engine on unit (para 5-12.*b*. and figure 5-7).

Section IX. GEAR HOUSING, COVER, AND TIMING GEARS

7-19. General. The gear housing and cover, mounted to the front of the engine, covers the engine drive gears. The gear housing also forms the front support for the engine. The front oil seal for the crankshaft is also installed in the cover plate. The cover plate can be removed for inspection of the gears without removing the gear housing. The timing gears housed within the gear housing are the crankshaft drive gear (attached to the crankshaft), camshaft drive gear, an idler gear, and the fuel injection pump drive gear. Timing marks are provided on the crankshaft gear and camshaft gear to facilitate correct gear timing at assembly. Timing of the fuel injection pump is found in para 7-3.*f*.

7-20. Gear Housing, Cover, and Timing Gears.

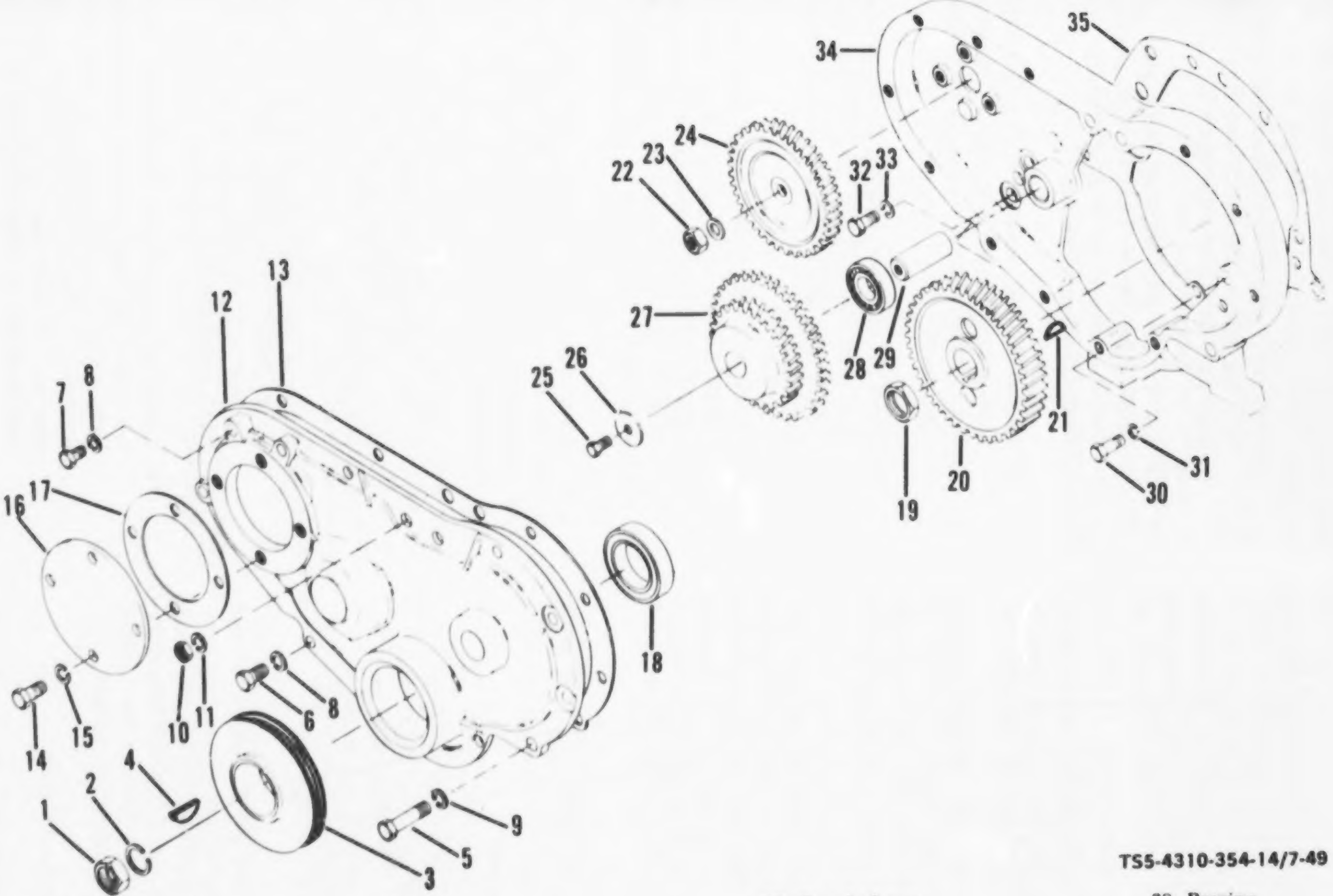
a. Removal and Disassembly.

(1) Remove the engine from the unit (para 5-12 and figure 5-7).

(2) Remove the fan and drive belt (figure 7-33).

(3) Remove the alternator and mounting bracket (figure 4-25).

(4) Remove crankshaft nut (1, figure 7-49) and lock washer (2) that secure the fan drive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20
31
30
18
10
11
6
8
14
15
4
2
1
9
5
3

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1. Crankshaft nut
2. Lock washer
3. Pulley assy
4. Key
5. Cap screw
6. Cap screw (3)
7. Cap screw (8)
8. Lock washer (11)
9. Lock washer
10. Nut
11. Lock washer
12. Gear housing cover
13. Gasket
14. Cap screw (4)
15. Lock washer
16. Thrust plate
17. Gasket
18. Oil seal
19. Camshaft nut
20. Camshaft gear
21. Key
22. Fuel pump gear nut
23. Washer
24. Fuel pump gear
25. Cap screw
26. Washer
27. Idler gear
28. Bearing
29. Idler shaft
30. Cap screw (5)
31. Lock washer (2)
32. Cap screw
33. Washer (2)
34. Gear housing
35. Gasket

Figure 7-49. Gear housing, cover, and timing gears, disassembly and reassembly.

pulley (3) to crankshaft. Use a puller to remove the pulley assembly (3). Remove pulley key (4).

(5) Remove cap screws (5, 6, 7), lock washers (8, 9), nut (10) and lock washers (11). Separate gear housing cover (12) from gear housing (34) and remove gasket (13). Remove cap screws (14), lock washers (15), thrust plate (16), and gasket (17). Press oil seal (18) out of cover (12).

(6) Remove the fuel injection pump (figure 7-15), removing the injection pump gear nut (22), figure 7-49), washer (23), and gear (24).

(7) Remove cap screw (25), washer (26), and idler gear (27) from idler shaft (29). As necessary, remove bearing (28) from idler gear (27). Remove idler shaft (29) only when necessary.

(8) Insert a brass bar between crankshaft gear and camshaft gear (20) to keep camshaft from turning. Remove the camshaft nut (19). Use a foot-type gear puller inserted through holes in camshaft gear (20) and pull gear (20) from camshaft. Remove camshaft gear key (21).

(9) Remove the oil pan (para 7-15*a*, as applicable).

NOTE

When removing front oil pan adapter (15, figure 7-41), remove stud nuts (11) and lock washers (12) first; then, remove cap screws (13) and lock washers (14) that attach adapter (15) to gear housing.

(10) Remove cap screws (30, 32, figure 7-49) and lock washers (31, 33) that attach gear housing (34) to cylinder block. Tap the gear housing with a soft hammer to loosen from cylinder block and dowels. Remove the housing and gasket (35). Discard the gasket.

b. Cleaning, Inspection, and Repair.

(1) Discard and replace all gaskets and seals. Make certain that all old gasket material is removed from sealing surfaces.

(2) Clean all parts, except bearing (28, figure 7-49) in accordance with para 5-7*f*. Wipe the bearing (28) clean with a clean, lint-free cloth.

(3) Inspect the gear cover (12) and gear housing (34) for cracks, distortion, and other damage. Replace either if damaged.

(4) Check that gear housing dowel pins and studs in the cylinder block are tight and that the stud threads are in good condition. Replace any damaged parts.

(5) Inspect the fuel pump drive gear (24), camshaft gear (20), and idler gear (27) for chipped, cracked, or broken teeth. Replace damaged gears.

(6) Check the idler gear bearing (28) for wear or rough operation. There should be just perceptible play in the bearing. Replace a worn bearing.

(7) Check that the idler gear shaft (29) is tightly fitted in the gear housing (34). It must withstand a direct pull of 32 pounds (14.515 kg). Replace a loose-fitting idler gear shaft. (Use Loctite, or equivalent.)

c. Reassembly and Installation. Refer to figure 7-49; reassemble and install the gear housing, cover and timing gears as follows:

(1) Cement a new gasket (35) to the gear housing (34), allowing the cement to dry sufficiently to prevent the gasket from slipping at installation.

(2) Place the gear housing (34) on the cylinder block; install the attaching cap screws (32, 30) and lock washers (33, 31) but do not tighten completely.

(3) Install the front oil pan adapter (15, figure 7-41), securing adapter to the cylinder block first with two stud nuts (11) and lock washers (12). Secure the adapter (15) to the gear housing with four cap screws (13) and lock washers (14). Tighten the gear housing cap screws (13) and nuts (11) evenly and securely; then, tighten cap screws (32, 30, figure 7-49).

(4) Install the oil pan (para 7-15.*c*, as applicable).

(5) Install camshaft gear key (21, figure 7-49) in keyway on camshaft. Install camshaft gear (20) on camshaft with timing mark on the camshaft gear aligned with crankshaft gear timing mark as shown in figure 7-50. Insert a brass bar between the two gears to keep camshaft gear (20, figure 7-49) from turning and install camshaft nut (19). Torque the nut to 125 to 135 foot-pounds (17.2875 to 18.6705 kg-m). Remove brass bar.

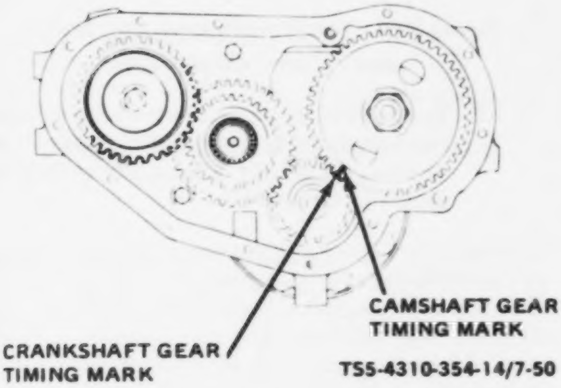

Figure 7-50. Aligning drive gear timing marks.

(6) If removed, install idler shaft (29). If removed, press bearing (28) into idler gear (27). Assemble idler gear and bearing assembly onto shaft (29). Use Loctite, or equivalent, on threads of cap screw (25) and attach idler gear (27) to shaft (29) with washer (26) and cap screw (25). Torque cap screw (25) to 25 foot-pounds (3.4575 kg-m).

(7) Turn the crankshaft so that flywheel timing marks indicate 20° BTDC for the number 1 cylinder.

(8) Install the fuel injection pump (figure 7-15), assembling the pump gear (24, figure 7-49), washer (23), and nut (22) on pump shaft.

(9) Use a small amount of sealing compound in the seal (18) bore of the gear housing cover (12) and press seal (18) into cover (12). If new seal is precoated, sealing compound is not required. Cement a new gasket (13) to gear housing cover (12).

(10) Clean and polish the oil seal surface of the crankshaft to remove any nicks and scratches which could damage the seal (18). Use an oil stone or very fine emery cloth to remove nicks and burrs and polish with crocus cloth. Cover the crankshaft keyway with a thin feeler gauge to protect seal (18) when installing gear housing cover (12).

(11) Apply a thin coating of oil soap to the seal (18) bore and the seal surface on the crankshaft. If new seal (18) is oil treated, additional lubrication is not required. Take care to keep the seal surface clean during reassembly. Install the gear housing cover (12) and attach to gear housing (34) with lock washers (8, 9, 11), cap screws (5, 6, 7), and nut (10).

(12) Install gasket (17), thrust plate (16), and attach to gear housing cover (12) with lock washers (15) and cap screws (14).

(13) Place pulley key (4) in crankshaft keyway and install pulley assembly (3). Install lock washer (2) and nut (1). Torque the nut (1) to 125 foot-pounds (17.2875 kg-m).

(14) Install the alternator bracket, screws, and lock washers (figure 4-25).

(15) Install the fan and belt (figure 7-33).

(16) Install the engine on the unit (para 5-12 and figure 5-7).

Section X. CAMSHAFT AND CAMSHAFT BEARINGS

7-21. General. The camshaft is supported on large diameter, pressure-lubricated, removable bearings in the crankcase. The camshaft is driven by the camshaft gear which meshes with the crankshaft gear. The crankshaft gear and camshaft gear each have timing marks for proper assembly of the camshaft to produce the proper firing order and operation of the rocker arm assembly. The camshaft operates the rocker arms in the proper order via the valve tappets and pushrods. A toothed portion of the camshaft, located near the center of the camshaft, engages with and drives the oil pump gear.

7-22. Camshaft and Camshaft Bearings.

a. Removal and Disassembly.

(1) Remove the engine from the unit (para 5-12 and figure 5-7).

(2) Remove the oil pan (para 7-15) and oil pump assembly (para 7-16).

(3) Remove the fan and drive belt (figure 7-33).

(4) Remove the gear housing cover (figure 7-49).

(5) Remove the cylinder head cover and rocker arm assembly (para 7-12). Remove the pushrods from cylinder block.

CAUTION

It is necessary for removal of the camshaft that the valve tappets be in the raised position. To accomplish this, set the engine on the bellhousing or upside down (support the engine on suitable blocks so that cylinder head studs clear), and push the tappets to raised position.

(6) With the tappets in the raised position, rotate the engine crankshaft until the two holes in the camshaft gear expose the thrust plate mounting bolts; see figure 7-51.

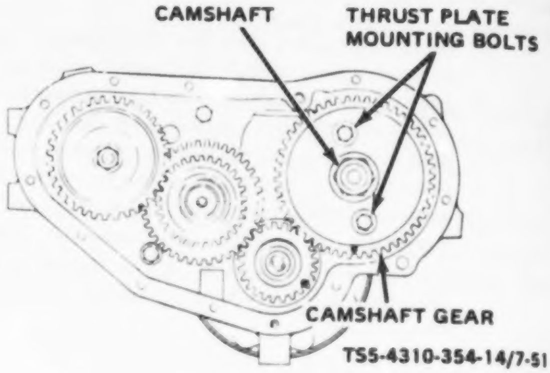

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Figure 7-51. Thrust plate mounting bolts, removal and installation.

(7) Remove the thrust plate mounting bolt and washer assembly and pull the camshaft assembly forward out of the cylinder block as shown in figure 7-52.

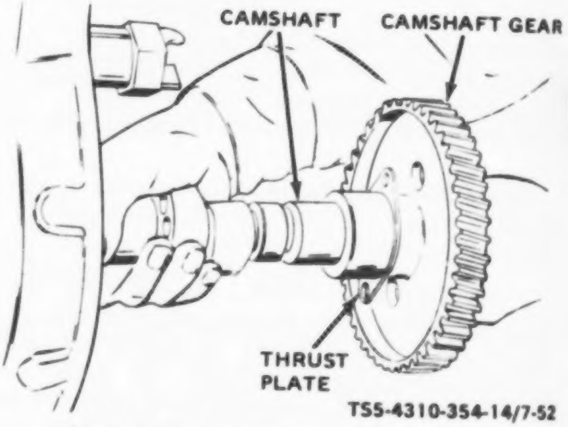

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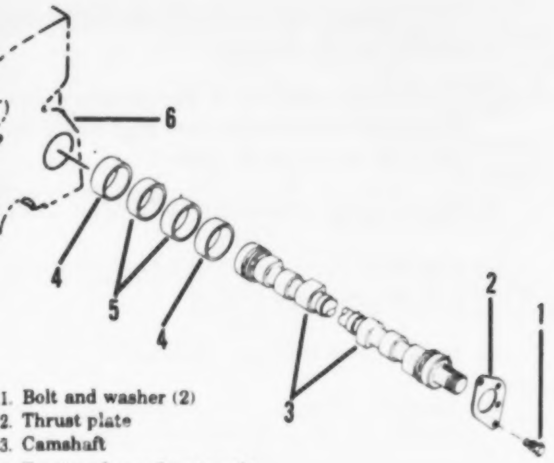
Figure 7-52. Camshaft and thrust plate, removal and installation.

(8) Remove the camshaft bearings (4, 5, figure 7-53). If the bearings cannot be withdrawn by hand, drive out the camshaft bearings (4, 5) with a brass drift. If difficulties are encountered removing the rear camshaft bearing, it may be necessary to remove the bellhousing (para 7-18).



1. Bolt and washer (2)
2. Thrust plate
3. Camshaft
4. Front and rear bearing (2)
5. Intermediate bearing (2)
6. Crankcase

TS5-4310-354-14/7-53

Figure 7-53. Camshaft and bearings, removal and installation.

(9) If it is necessary to remove the camshaft gear from the camshaft, remove the nut, place the shaft in an arbor press and, with suitable supports under the gear, press the shaft out of the gear. Remove key from camshaft and remove the camshaft thrust plate.

(10) After the camshaft has been removed from the engine, the valve tappets can be removed from the underside of the block, as necessary.

b. *Cleaning, Inspection, and Repair.*

(1) Clean all parts in accordance with para 5-7*f*.

(2) Inspect the camshaft (3, figure 7-53) for scored or worn cams and bearing surfaces, damaged oil pump gear, threads or keyway, or worn thrust surfaces. Replace camshaft (3) if it has scuffed, scored, or cracked valve cams. Replace camshaft if any bearing journal diameter is worn to less than 2.051 inches (52.0954 mm).

(3) Inspect the bearings (4, 5) for scored or worn bores, cracks, or scored faces. Replace worn or damaged bearings. The maximum allowable clearance between camshaft journal and bearing bore is 0.006 inch (0.1524 mm).

(4) Inspect the thrust plate (2) for worn or scored thrust surfaces and distortion.

(5) Inspect the camshaft gear for worn, cracked, or broken teeth, and worn keyway. Replace a damaged gear.

(6) Check the valve tappets for wear and replace any that exceed 0.005 inch (0.127 mm) clearance in the cylinder block bore.

c. *Reassembly and Installation.*

(1) Insert the valve tappets in their respective holes in the cylinder block. Make certain that they are in the raised position in the block before installing the camshaft.

(2) Install the front, rear, and intermediate camshaft bearings (4, 5, figure 7-53) in the cylinder block. Replacement camshaft bearings are precision cut and no line reaming is required. When installing, make sure the oil holes in the bearings are aligned with the oil holes in the drilled passageways in the cylinder block. Tap bearings into place with a bearing driver.

(3) If the camshaft gear was removed from the camshaft (3), place the thrust plate (2) on the camshaft (3) and press the gear onto the camshaft with key in place. Secure with nut. Make certain all tappets are in the raised position. Carefully insert the assembled camshaft into the cylinder block, aligning the timing marks on the camshaft gear with the timing marks on the crankshaft gear (figure 7-50). This ensures correct timing of the valves.

(4) Secure the thrust plate to the cylinder block with two bolt and washer assemblies (figure 7-51). Check the camshaft end play. Normal end play is 0.005 to 0.008 inch (0.127 to 0.203 mm) and shall not exceed 0.012 inch (0.3048 mm). To decrease end play, use a draw file to remove a small amount of metal from the camshaft gear hub on which the thrust plate rides. See figure 7-54. To increase end play, add a shim between the camshaft gear hub and the camshaft bearing, or, using a piece of very fine emery cloth on a surface plate, polish the thrust plate to the desired thickness. Check the backlash of the camshaft gear to the crankshaft gear.

The backlash must be 0.0015 to 0.0025 inch (0.0381 to 0.0635 mm).

(5) Install the pushrods in the cylinder block. Install the rocker arm assembly and cylinder head cover (para 7-12).

(6) Install the gear housing cover (figure 7-49).

(7) Install the oil pump assembly (para 7-16) and oil pan (para 7-15).

(8) Install drive belt and fan (figure 7-33).

(9) Install the engine (para 5-12 and figure 5-7) and adjust the valve clearance (figure 4-32).

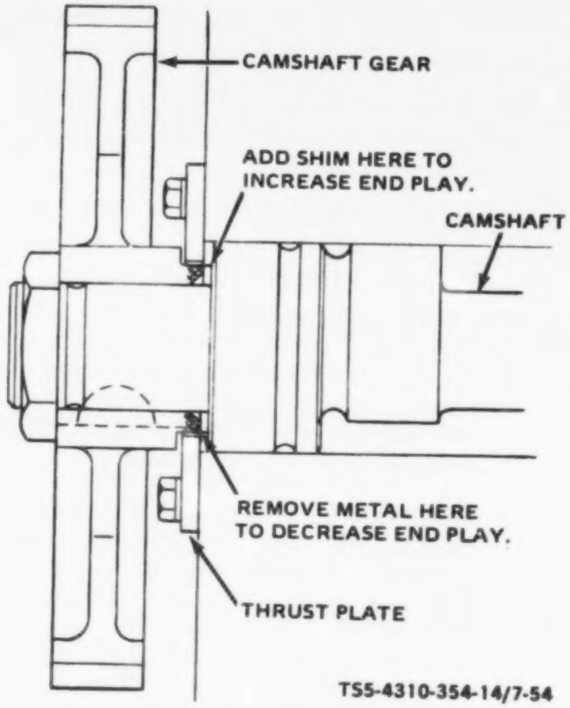

CAMSHAFT GEAR
ADD SHIM HERE TO INCREASE END PLAY.
CAMSHAFT
REMOVE METAL HERE TO DECREASE END PLAY.
THRUST PLATE
TS5-4310-354-14/7-54

Figure 7-54. Adjusting camshaft end play.

Section XI. PISTONS, PISTON RINGS, AND CONNECTING ROD ASSEMBLIES

7-23. General. The pistons are the solid type, having no saw slots or splits in the skirt. Piston ring sets consist of compression rings and oil regulating rings. The piston pin is the full floating type, able to rotate in the piston as well as in the connecting rod bushing. The connecting rods are heavy alloy steel forgings with precision-type bearings for the crankshaft and bronze bushings for the piston pins.

7-24. Pistons, Piston Rings, and Connecting Rod Assemblies.

a. Removal and Disassembly.

(1) Remove the engine from the unit (para 5-12 and figure 5-7).

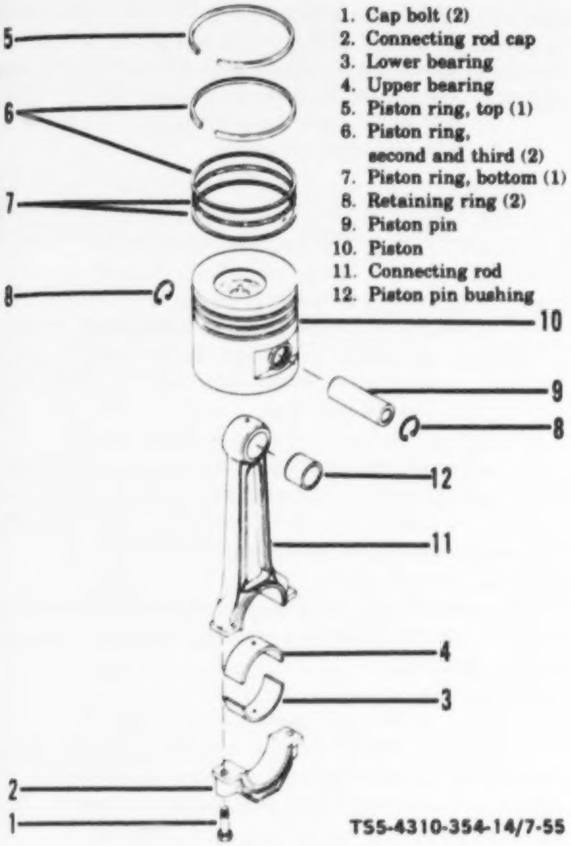
(2) Remove cylinder head cover, rocker arm assembly, and pushrods (para 7-12).

(3) Remove the cylinder head assembly (para 7-13).

(4) Remove the oil pan (para 7-15) and oil pump assembly (para 7-16).

(5) Carefully scrape the carbon deposits from the top of each cylinder bore so that the pistons can be removed without damage to the rings. On cylinder bores with excessive wear, it may be necessary to use a ridge reamer.

(6) Crank the engine so that the No. 1 piston connecting rod caps can be removed. Remove the cap bolts (1, figure 7-55), connecting rod cap (2), and lower bearing (3). Be sure to keep the connecting rod (11), cap (2), and bearings (3, 4) for each piston together. Do not mix parts. With a block of wood or hammer handle, carefully push the piston and rod assembly out through top of the cylinder block. (See figure 7-56). After the connecting rod and piston are removed from the cylinder block, reassemble the connect-



1. Cap bolt (2)
2. Connecting rod cap
3. Lower bearing
4. Upper bearing
5. Piston ring, top (1)
6. Piston ring, second and third (2)
7. Piston ring, bottom (1)
8. Retaining ring (2)
9. Piston pin
10. Piston
11. Connecting rod
12. Piston pin bushing

Figure 7-55. Piston, piston rings, and connecting rod assembly, disassembly and reassembly.

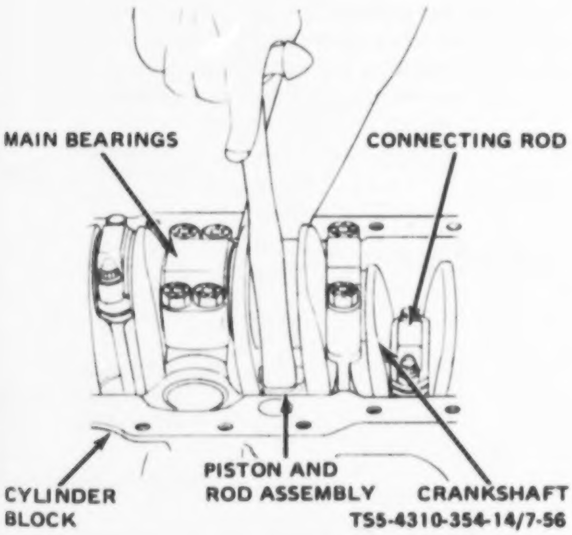


Figure 7-56. Piston and connecting rod, removal.

ing rod cap (2, figure 7-55) and lower bearing (3) to the connecting rod (11).

(7) Remove the remaining pistons and connecting rod assemblies in a similar manner. Rotate the crankshaft as necessary to provide easy access to each connecting rod cap.

(8) Secure the connecting rod (11) in a vise equipped with soft jaws and remove the piston rings (5, 6, 7) with a piston ring expander tool.

(9) To disconnect the connecting rods (11) from the pistons (10), remove the piston pin retaining rings (8) and push the pin (9) out of the piston (10) and piston pin bushing (12).

b. *Cleaning, Inspection, and Repair.*

(1) Clean all parts in accordance with para 5-7*f*. If this does not remove the carbon deposits, use a suitable chemical carbon solvent that will not attack the aluminum pistons (10, figure 7-55) or the bronze piston pin bushings (12).

(2) Clean the compression ring grooves of the piston (10). This can be done with a broken compression ring that has been ground to a bevel edge.

(3) Using a standard aligning fixture, check the connecting rod (11) for distortion and misalignment. Check the connecting rods (11), caps (2), and bolts (1) for cracks with magnetic particle test. Discard and replace parts if cracks are detected.

(4) Inspect the connecting rod bearings (3, 4) for scoring, chipping, flaking, pits, cracks, and signs of overheating. Bright spots on back of bearings indicate shifting and are cause for replacement.

(5) Check the piston pin bushing (12) for scoring or wear. Replace bushing if bore is scored or if worn to more than 1.2523 inches (31.8084 mm). Press worn bushing (12) from connecting rod (11) and press in new one.

(6) Inspect the piston pin (9) for wear or scoring. Replace pin if worn to less than 1.2478-inch (31.6941 mm) diameter. Maximum allowable pin clearance in piston is 0.0005 inch

(0.0127 mm) and in connecting rod is 0.0012 inch (0.0305 mm).

(7) Inspect the pistons (10) for damaged ring grooves, scoring, or cracks. Remove light scoring with fine emergy cloth. Replace piston if damaged beyond repair.

c. Reassembly and Installation.

NOTE

All parts should be at room temperature to ensure proper dimensional tolerances during piston and ring fitting.

(1) Check the fit of the piston without rings in the cylinder bore with a feeler 0.005 x ½-inch (0.127 x 12.7 mm) between the piston and bore. Use a spring scale to determine the force required to withdraw the feeler stock. A newly honed bore with a new piston should require between 5 and 8 pounds (2.27 and 3.63 kilograms) pull. A used piston in a honed bore must require a minimum of 5 pounds (2.27 kilograms) of pull. If any binding occurs, remove the piston and examine the piston and cylinder wall for burrs. Remove burrs with a fine hone (a flat one is preferable) before proceeding with the clearance check. If a new standard piston is to be installed, specify size by the letter A, B, C, or D stamped on top of the piston.

(2) All new piston rings must be installed whenever a piston is removed, regardless of whether a new or used piston is installed.

(3) Insert one ring at a time inside of the cylinder bore, far enough down to be within the normal area of the ring travel. Use a piston to push down the ring to be sure it is parallel with the top of the cylinder bore. Measure the ring gap with a feeler gauge. All ring gaps shall be 0.010 to 0.020 inch (0.254 to 0.508 mm).

(4) Check the ring clearance in the piston ring grooves. (See table 5-2.)

(5) Assemble each piston (10, figure 7-55) and connecting rod assembly (11) by placing the upper end of the connecting rod between the piston pin bosses and in line with the piston pin holes. Then, siide the piston pin (9) in place. To facilitate assembly, heat the piston (10) in boiling water for a few minutes, but do not heat the piston pin (9). Install the pin retaining rings (8).

(6) Install the piston rings (5, 6, 7) on the piston (10) as follows:

(a) Install the rings on the piston with an expander tool. To avoid breaking or overstressing the rings, do not spread them any more than necessary to slip them over the piston.

(b) When installing the piston rings, stagger the positions of the ring gaps around the piston to minimize compression loss. No two ring gaps may be in line.

(c) When installing piston rings with undercut grooves, note the following instructions:

1. On all piston rings that have the groove on the outside diameter of the ring, place the undercut or groove towards the bottom of the piston. See figure 7-57.

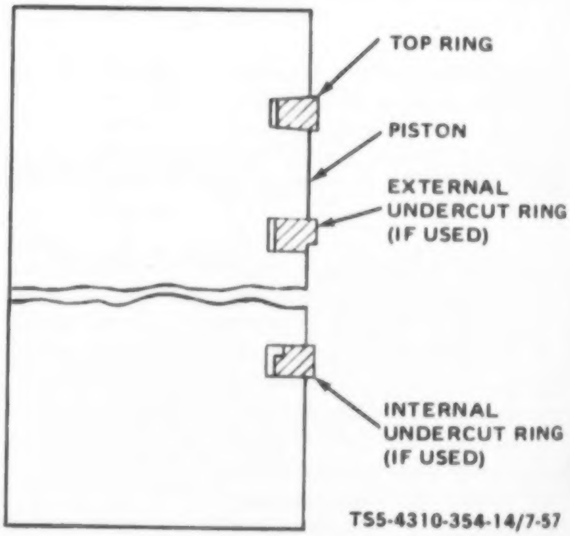

TOP RING
PISTON
EXTERNAL UNDERCUT RING (IF USED)
INTERNAL UNDERCUT RING (IF USED)
TS5-4310-354-14/7-57

Figure 7-57. Piston ring installation.

2. On all piston rings that have the groove cut on the inside diameter of the ring, place the undercut or groove towards the top of the piston. See figure 7-57.

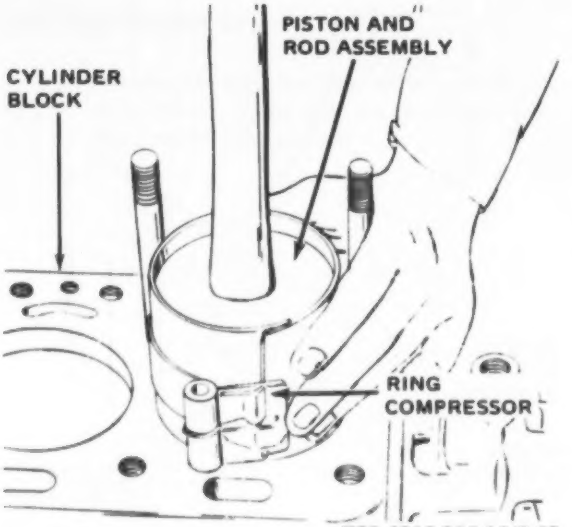
(7) Inspect the crankshaft for any rough or scored marks that might damage the connecting rod bearing. If any rough marks are found, polish the shaft with an oil stone, very fine emery cloth, or crocus cloth. Clean the shaft thoroughly after polishing.

NOTE

The cylinder number is stamped on the connecting rods and caps on the camshaft side and to the front of the engine.

(8) Select the proper piston and connecting rod assembly for the first cylinder bore and turn the crankshaft so that the connecting rod journal for that cylinder is in the lowered position. Apply a coat of lubricating oil to the cylinder bores, pistons, rings, piston pin, and crankshaft journal.

(9) Use a ring compressor to compress the piston rings to facilitate installation of the piston and rod assemblies. With the connecting rod bearing cap and bearings removed from the connecting rod, insert the piston from the top of the cylinder block. Use a hammer handle or block of wood against the top of the piston to push the piston into the cylinder bore. See figure 7-58. Take care that the connecting rod is in line with the crankshaft journal and will not score the journal.



TS5-4310-354-14/7-58

Figure 7-58. Piston installation.

(10) Install the bearings and connect the connecting rod to the crankshaft as follows:

(a) With the piston entirely in the cylinder bore, insert the upper bearing (4, figure 7-55) in the connecting rod (11). Pull the piston and rod assembly down until the upper rod bearing (4) seats firmly on the crankshaft journal.

(b) To check crankshaft journal-to-bearing shell clearance, place a piece of plastic gauge material the full width of the lower bearing (3) about ¼-inch (6.35 mm) off center (see figure 7-59). Rotate the

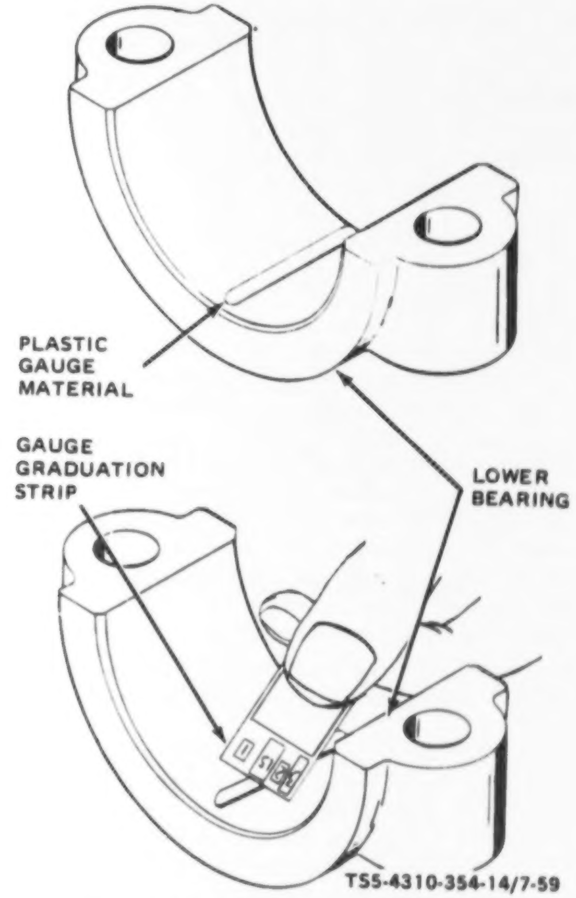


Figure 7-59. Checking connecting rod bearing clearance.

crankshaft about 30° from bottom dead center and install the connecting rod cap (2, figure 7-55). Tighten the connecting rod cap bolts (1) to 70 foot-pounds (9.681 kg-m) torque.

(c) Remove the connecting rod cap (2). The flattened plastic gauge material will be found adhering to either the lower bearing (3) or the crankshaft. Compare the width of the flattened plastic gauge material at its widest point with the graduations on the package, as shown in figure 7-59. The required clearance for new parts is 0.001 to 0.003 inch (0.0254 to 0.0762 mm). With used parts, the maximum allowable clearance is 0.005 inch (0.127 mm).

(d) If the clearance is within required limits, remove the gauge material and reinstall the connecting rod bearings and cap. Tighten the bolts to 68 to 72 foot-pounds (9.40 to 9.96 kg-m) torque. Check the connecting rod side clearance; it should be 0.005 to 0.012 inch (0.127 to 0.305 mm) with a maximum clearance of 0.020 inch (0.508 mm).

(11) Install the remaining piston and connecting rod assemblies in a similar manner.

(12) Install the oil pump assembly (para 7-16) and the oil pan (para 7-15).

(13) Install the cylinder head assembly (para 7-13).

(14) Install the pushrods, rocker arm assembly, and cylinder head cover (para 7-12).

(15) Install the engine on the unit (para 5-12 and figure 5-7). Adjust the valve clearance (figure 4-32).

Section XII. CRANKSHAFT AND MAIN BEARINGS

7-25. General. The crankshaft is a machined forging with surface-hardened bearing journals. The shaft has passages drilled to carry oil, under pressure, to the connecting rod bearings. Normally, it is not necessary to remove the crankshaft gear from the crankshaft. The use of five main bearings permits a main bearing to be placed on each side of each connecting rod bearing. This construction helps to eliminate vibration at high speeds. The main bearings are removable, precision, shell-type bearings. The upper shell of each bearing is not interchangeable with the lower shell. No shims are used. These precision-type shells are completely finished before being put in place and no line reaming or scraping is required.

7-26. Crankshaft and Main Bearings.

a. *Removal and Disassembly.*

(1) Remove the engine from the unit (para 5-12 and figure 5-7).

(2) Remove the fan and drive belt (figure 7-33).

(3) Remove the oil pan and seal adapters (para 7-15) and the oil pump assembly (para 7-16).

(4) Remove the fan drive pulley, gear housing cover, and gear housing (para 7-20).

(5) Remove the flywheel and bellhousing (para 7-18).

(6) Invert the engine to facilitate removal of main bearing caps and crankshaft.

(7) Remove the cap bolts (1, 2, figure 7-60) and main bearing caps (3, 4, 5, 6). Remove the main bearing caps and the lower main bearings (7,8), one cylinder at a time. Keep each bearing matched with its bearing cap. It may be necessary to use a small pry bar to remove the main bearing caps from the cylinder block. Be careful not to score or mar the crankshaft journals.

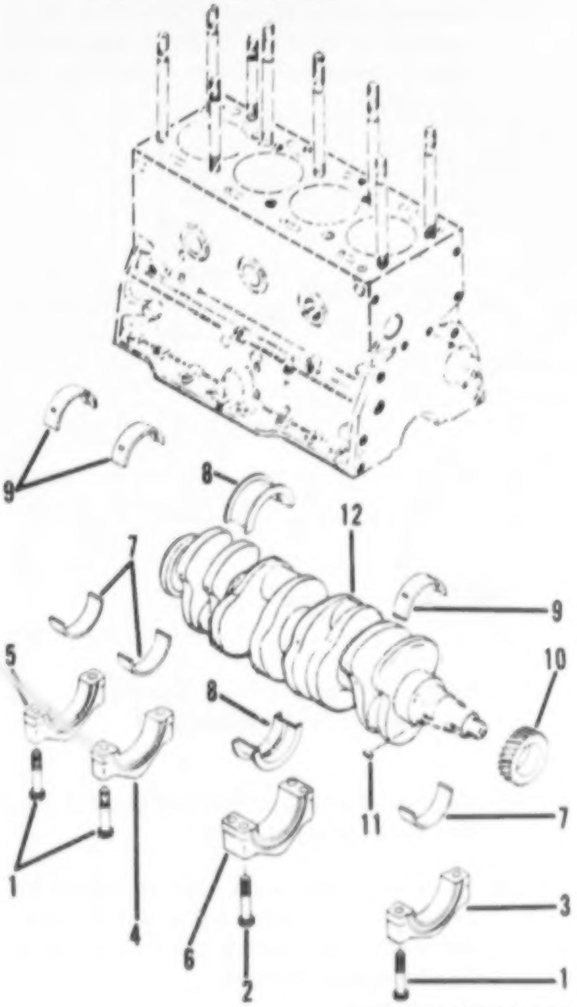


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Figure 7-60. Crankshaft and main bearings, removal and installation.

KEY to figure 7-60:

1. Cap bolt (8)
2. Center cap bolt (4)
3. Front main bearing cap
4. Intermediate main bearing cap (2)
5. Rear main bearing cap
6. Center main bearing cap
7. Lower main bearing half
8. Center main bearing
9. Upper main bearing half
10. Crankshaft gear
11. Key
12. Crankshaft

(8) To remove the upper main bearings (8, 9) without removing the crankshaft (12), insert a small tee-shaped pin in the crankshaft oil hole. Rotate the crankshaft (12) so that the pin will push the upper main bearing out, as shown in figure 7-61. If the crankshaft is to be removed, remove the upper bearings after removing the crankshaft.

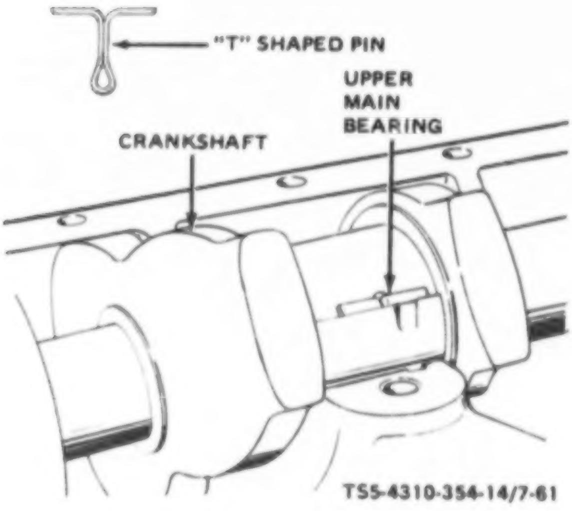


Figure 7-61. Upper main bearings, removal and installation.

(9) Remove the connecting rod bearing caps and bearings (para 7-24).

(10) Use a rope sling and a hoist to remove the crankshaft (12, figure 7-60) from the cylinder block. Take care to prevent scoring of the crankshaft journals.

(11) Remove the upper main bearings (8, 9) from the cylinder block.

b. Cleaning, Inspection, and Repair.

(1) Discard and replace all gaskets and seals.

(2) Clean all parts in accordance with para 5-7*f*.

(3) Clean the oil passages in the crankshaft (12, figure 7-60) with a small tube brush.

(4) Inspect the crankshaft gear (10) for cracked or worn gear teeth. If gear removal is necessary, properly support the crankshaft (12) and gear in an arbor press and remove the gear (10) from the crankshaft (12). Remove the woodruff key (11). If the gear must be replaced and an arbor press is not available, use a ¼-inch (6.35 mm) drill centered midway between the edge of the keyway and the base of the gear teeth and drill through the gear parallel with the keyway. Spread the gear with a chisel and pull from the shaft. Be careful not to drill into the crankshaft.

(5) Inspect the bearing caps (3, 4, 5, 6) for cracks and distortion. Replace if damaged.

(6) Inspect the main bearings (7, 8, 9) for scoring, chipping, flaking, pits, and signs of overheating. Bright spots on back of bearings indicate shifting and are cause for replacement. Replace all main bearings if one or more is damaged and requires replacement.

(7) Inspect the crankshaft (12) for cracks, scored journals, and misalignment. Replace if damaged beyond repair. Perform detailed inspection of the crankshaft as follows:

(a) Check the surfaces of the crankshaft for cracks. There are several methods of determining the presence of minute cracks not visible to the eye. These inspection methods include magnetic particles, fluorescent magnetic particles, and fluorescent penetrant. Check for circumferential fillet cracks at the critical areas, and 45° cracks (45° with axis of the shaft) starting from either the critical fillet locations or the crankshaft holes. Cracks of this nature require replacement of the shaft.

(b) Inspect the keyways for cracks, or wear; replace the shaft if necessary.

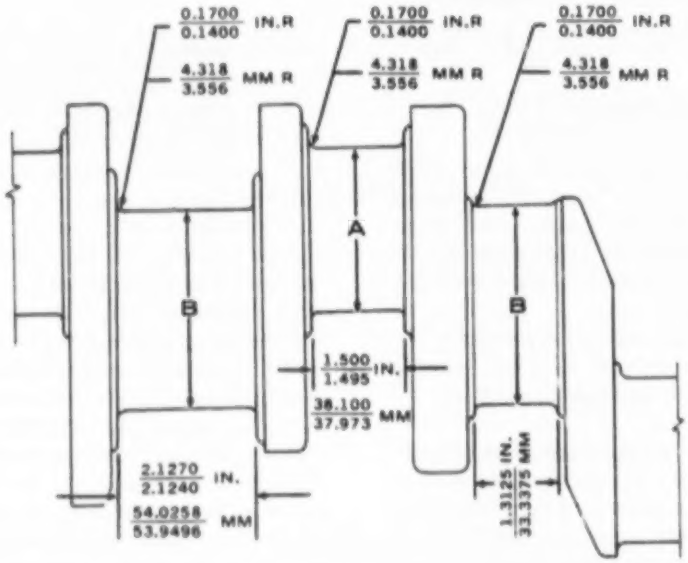
(c) If the crankshaft is worn so that the maximum journal-to-bearing clearance (with new bearings) exceeds 0.007 inch (0.178 mm), or the maximum taper is 0.0015 inch (0.038 mm), or the out-of-round is 0.002 inch (0.051 mm), the crankshaft must be reground to 0.010, 0.020, 0.030, 0.040, or 0.060 inch (0.254, 0.508, 0.762, 1.016, or 1.524 mm) undersize. Proceed as follows:

1. Prior to grinding a crankshaft, check carefully for cracks which start at an oil hole and follow the journal surface at an angle of 45° to the axis. Any crankshafts with such cracks must be rejected, as these cracks indicate torsional fatigue. Grinding of the shaft will increase the stress at the cracks causing eventual failure.

2. Measure the crankshaft journals, and compare these measurements to the diameters required for various undersize bearings shown in table 7-1. These measurements will determine the size to which the crankshaft journals must be reground.

3. If one or more main or connecting rod journals require grinding, then all main or all connecting rod journals must be ground to the same required size.

Table 7-1. Crankshaft Journal and Crankpin Dimensions


0.1700/0.1400 IN.R
4.318/3.556 MM R
0.1700/0.1400 IN.R
4.318/3.556 MM R
0.1700/0.1400 IN.R
4.318/3.556 MM R
A
B
B
1.500/1.495 IN.
38.100/37.973 MM
2.1270/2.1240 IN.
54.0258/53.9496 MM
1.3125 IN.
33.3375 MM

Bearing sizes		Connecting rod journal dia "A"		Main bearing journal dia "B"	
Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
Standard		2.3730-2.3740	60.2742-60.2996	2.8734-2.8744	72.9844-73.0098
0.010 undersize	0.254	2.3630-2.3640	60.0202-60.0456	2.8634-2.8444	72.7304-72.7558
0.020 undersize	0.508	2.3530-2.3540	59.7662-59.7916	2.8534-2.8544	72.4764-72.5018
0.030 undersize	0.762	2.3430-2.3440	59.5122-59.5376	2.8434-2.8444	72.2224-72.2478
0.040 undersize	1.016	2.3330-2.3340	59.2582-59.2836	2.8334-2.8344	71.9684-71.9938
0.060 undersize	1.524	2.3130-2.3140	58.7502-58.7756	2.8134-2.8144	71.4604-71.4858

4. When regrinding crankshafts, all journal fillets must have a 0.140 to 0.170-inch (3.556 to 4.318 mm) radius between the crank cheek and the crank journal, and must not have any sharp grind marks. The fillet must blend smoothly into the journal and cheek, and must be free of scratches.

5. After all of the regrinding operations have been completed, perform another magnetic particle inspection of the crankshaft to determine whether grinding cracks have originated due either to insufficient cooling or crowding of the grinding wheel. Finally, demagnetize the crankshaft.

6. Wash and clean the crankshaft with diesel fuel and blow dry with air. Blow out the oil passages to make sure they are clear.

c. *Reassembly and Installation.*

(1) Install the crankshaft gear (10, figure 7-60) onto the crankshaft. Use an arbor press, if available, to press the gear on the shaft. Make sure the woodruff key (11) is in place. If an arbor press is not available, the following method may be used:

(a) Insert the woodruff key (11) in the crankshaft (12) keyway.

(b) Lay the gear (10) on a sheet of asbestos or other fireproof material and, with a torch, heat the gear evenly on both sides until the gear turns a pale straw yellow. (If the gear is clean and untarnished, this color will indicate it is heated to approximately 450°F (232°C).

(c) Assemble the hot gear (10) on the crankshaft (12) and quickly drive the gear into the correct position. A piece of 2-inch (50.8 mm) diameter pipe may be used as a driver.

(d) Allow the gear and shaft to cool.

(2) Install the upper main bearings (8, 9) in the cylinder block. The upper bearings are the bearings with two holes and an oil groove. The bearings must be installed in the same positions from which they were removed.

NOTE

The upper main bearings (8, 9) can be installed with the crankshaft (12) in place. Install a small tee-shaped pin into the crankshaft oil hole. After starting the bearing into place, rotate the crankshaft to seat it on the cylinder block, as shown in figure 7-61.

(3) Apply clean engine oil to all of the crankshaft journals and bearings and, using a sling and hoist, carefully set the crankshaft in place so that the timing marks on the crankshaft gear and the camshaft gear align as shown in figure 7-50.

(4) With the lower main bearings (7, 8, figure 7-60) installed in the bearing caps (3, 4, 5, 6) from which they were removed, install the caps in their original positions on the cylinder block. The caps are marked with the cylinder number in which they are used. The center main bearing cap (6) is secured with four ½-inch (12.7 mm) diameter bolts (2). The remaining bearing caps (3, 4, 5) are secured with two ⁹⁄₁₆-inch (14.2875 mm) diameter bolts (1) each. Draw the bolts up snug, then rap the caps sharply with a soft hammer to seat them properly. Check the original center main bearing cap (6) for a T stamped on the side opposite the cylinder number to determine the required torque value. Tighten the bearing cap bolts (1, 2) to the torque specified in table 1-1. Start with the center cap and work alternately toward both ends of the block. If the bearings have been installed properly, the crankshaft will turn freely with all main bearing caps drawn down to the specified torque.

(5) After installing crankshaft with new bearings and center thrust bearing, check the crankshaft end thrust. Insert different dimension feeler gauges until one just fits between the center thrust bearing and the crankshaft as shown in figure 7-62. This dimension must be between 0.005 and 0.010 inch (0.127 and 0.254 mm) for new bearings, and the maximum allowable clearance of 0.015 inch (0.381 mm). Insufficient clear-

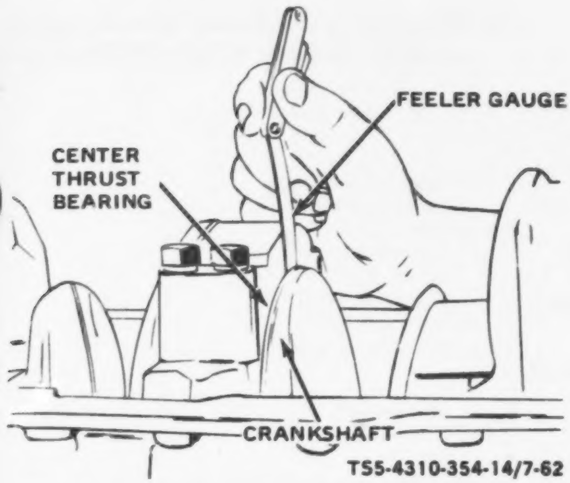


Figure 7-62. Checking crankshaft end thrust.

ance can be the result of a misaligned main bearing, or a burr or dirt on the inner face of the thrust bearing flange. Disassemble, clean, and reassemble as necessary. If clearance is still insufficient, polish the thrust bearing flanges on a flat surface with crocus cloth to obtain the proper clearance.

(6) Position the connecting rods so that they engage the journals of the crankshaft. Apply a coat of engine oil to the bearing shells to assure proper lubrication. Install the connecting rod bearings and bearing caps (para 7-24).

(7) Install the bellhousing and flywheel (para 7-18).

(8) Install the gear housing, housing cover, and fan drive pulley (para 7-20).

(9) Install the oil pump assembly (para 7-16) and the seal adapters and oil pan (para 7-15).

(10) Install the fan and drive belt (figure 7-33).

(11) Install the engine on the unit (para 5-12 and figure 5-7).

Section XIII. CYLINDER BLOCK

7-27. General. The cylinder block is a one-piece casting which forms the main structural part of the engine. For uniform cooling, water jackets are provided the full length of the cylinders. The cylinder block has an oil header running the length of the block. From this header, various passages carry oil to the main bearings, camshaft bearings, and the rocker arms. The upper halves of the main bearing supports are cast integral with the block. The main bearing bores are line-bored with the bearing caps in place to ensure longitudinal alignment. The cylinder head assembly is mounted on top of the cylinder block. When the cylinder head is installed, the cylinder head gasket forms a tight seal between the head and the block. The oil pan is mounted on the bottom of the cylinder block enclosing the crankshaft and forming the reservoir for the engine lubricating oil.

7-28. Cylinder Block.

a. Removal and Disassembly.

(1) Remove the engine from the unit (para 5-12).

(2) Remove the alternator assembly (para 7-2).

(3) Remove the starting motor assembly (para 7-4).

(4) Remove the fuel injection nozzles (para 7-6).

(5) Remove the fuel injection pump (para 7-8).

(6) Remove the water pump and fan assembly (para 7-10).

(7) Remove the rocker arm, cylinder head, and valve assemblies (para 7-12 and 7-13).

(8) Remove the oil pan and oil pump assembly (para 7-15 and 7-16).

(9) Remove the flywheel and bellhousing (para 7-18).

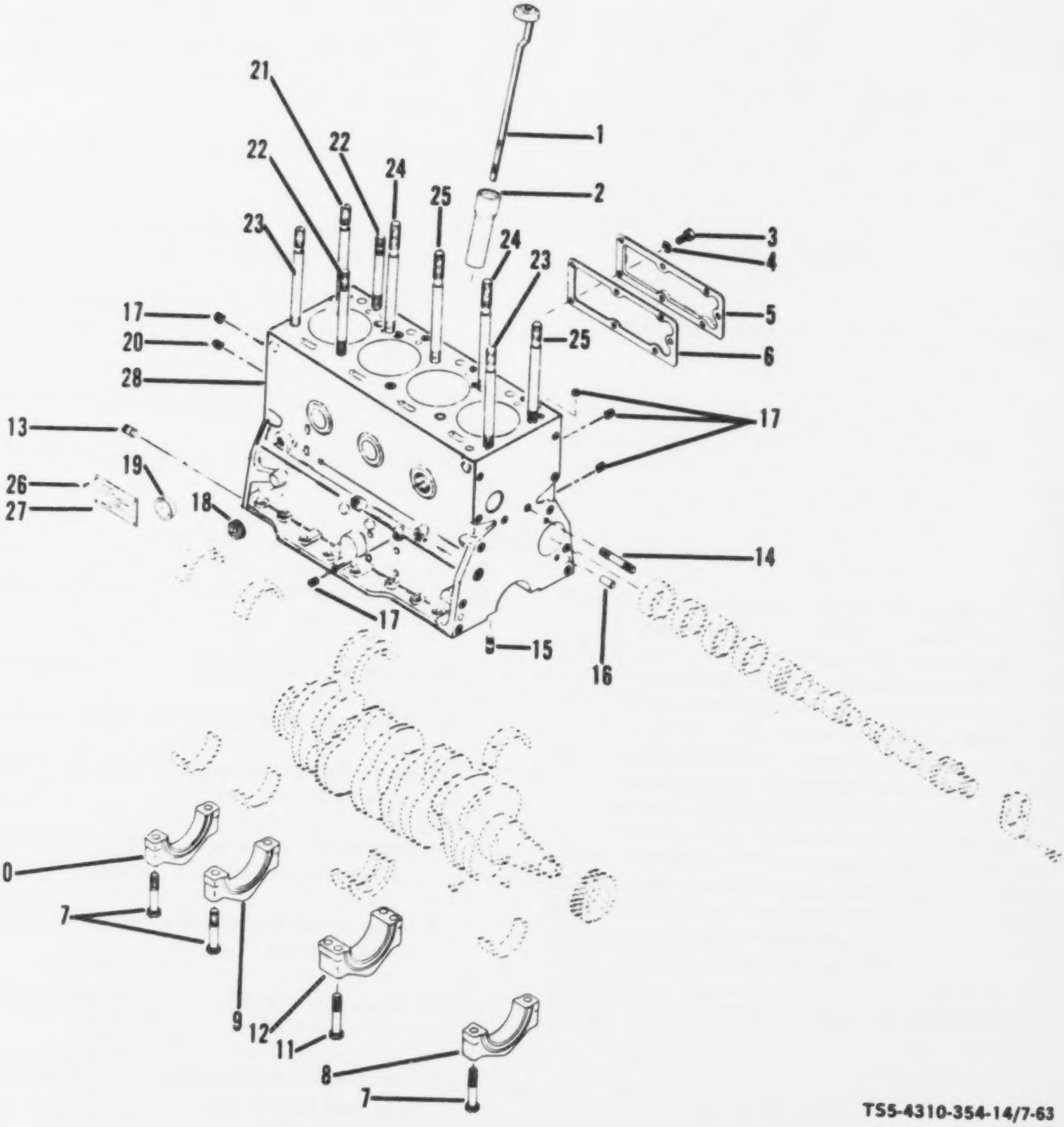
(10) Remove the gear housing cover, gear housing, and timing gears (para 7-20).

(11) Remove the camshaft and camshaft bearings (para 7-22).

(12) Remove the pistons and connecting rod assemblies (para 7-24).

(13) Remove the crankshaft and main bearings (para 7-26).

(14) Disassemble the cylinder block in numerical sequence shown in figure 7-63 as follows:


21
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TS5-4310-354-14/7-63

Figure 7-63. Cylinder block, disassembly and reassembly.

KEY to figure 7-63:

1. Oil level gauge
2. Oil filler tube
3. Cap screw (8)
4. Lock washer (8)
5. Cover (2)
6. Gasket (2)
7. Bearing cap bolts (8)
8. Front bearing cap
9. Intermediate bearing cap (2)
10. Rear bearing cap
11. Center cap bolt (4)
12. Center bearing cap
13. Bellhousing stud (2)
14. Gear housing stud
15. Oil pan adapter stud (4)
16. Dowel pin (4)
17. Oil passage pipe plugs (5)
18. Pipe plug
19. Expansion plug (2)
20. Setscrew
21. Cylinder head stud
22. Cylinder head stud (7)
23. Cylinder head stud (2)
24. Cylinder head stud (2)
25. Cylinder head stud (2)
26. Screw (4)
27. Ident plate
28. Cylinder block

NOTE

Do not remove expansion plugs (19) in core openings unless they show signs of leaking. Do not remove studs (13, 14, 15, 21, 22, 23, 24, 25) and dowel pins (16) unless damaged and require replacement. It is not necessary to remove pipe plugs (17, 18) or setscrew (20) unless signs of leakage are present and replacement of the part is needed.

(a) Pull oil level gauge (1) out of oil filler tube (2). The filler tube (2) is a press fit into cylinder block (28) and should not be removed except to replace if damaged.

(b) Remove cap screws (3), lock washers (4), two side covers (5) and gaskets (6).

(c) Only as necessary, remove main bearing cap bolts (7, 11) and the main bearing caps (8, 9, 10, 12) from cylinder block (28).

(d) As needed for replacement, remove bellhousing studs (13), gear housing stud (14), and oil pan adapter studs (15). Remove dowel pins (16) for replacement only.

(e) For cleaning of cylinder block passages only, remove pipe plugs (17, 18), expansion plugs (19), and setscrew (20).

(f) When damaged and replacement is required, remove cylinder head studs (21 thru 25).

(g) When replacing identification plate (27), remove screws (26) and plate (27). Make certain new plate is stamped with same data as appears on old plate to retain proper engine identification.

b. Cleaning, Inspection, and Repair.

(1) Clean block by submerging in tank of heated cleaning solvent. Circulate the solvent to increase cleaning effectiveness.

NOTE

If additional machining is to be performed, clean oil passage and reinstall plugs after all machining is completed.

(2) Clean oil passages by running a wire brush through them.

(3) Check the cylinder block for cracks by using dye penetrants. Replace a damaged block.

(4) Check for excessive cylinder bore wear by determining the diameter of the wear area and comparing this with the original cylinder bore diameter. Gauge at intervals of approximately 45 degrees. Refer to table 7-2 for standard bore dimensions. Maximum allowable wear is 0.005 inch (0.127 mm).

NOTE

If wear appears to be unusually excessive, check for original cylinder bore diameter by gauging the diameter of the cylinder below the piston ring wear area. The cylinder may already have been rebored for oversized pistons.

Table 7-2. Cylinder Bore Dimensions

Cylinder bore diameter	Manufacturing tolerance		Maximum allowable diameter	
	Inches	Millimeters	Inches	Millimeters
3¾ inch (95.25 mm)	3.749/3.751	95.225/95.275	3.756	95.402
0.020 oversize (0.508 mm)	3.769/3.771	95.773/95.783	3.776	95.910
0.040 oversize (1.016 mm)	3.789/3.791	96.241/96.291	3.796	96.418

(5) The out-of-round must not exceed 0.003 inch (0.0762 mm) or the taper must not be more than 0.002 inch (0.0508 mm) in each bore. Irregularities in the cylinder bore (out-of-round and taper) may result in galling and seizing of new pistons.

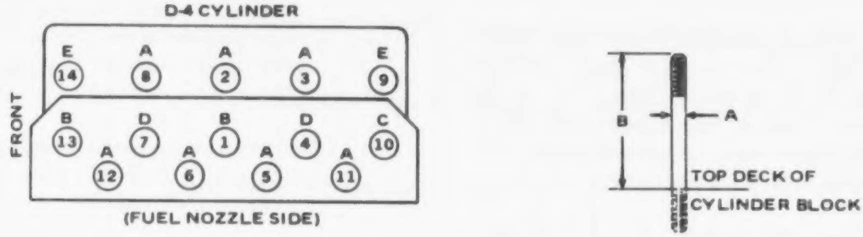
(6) If the cylinder bores are worn excessively, they can be rebored for 0.020 and 0.040-inch (0.508 and 1.016 mm) oversize pistons and piston rings. After boring, check the bore finish to be sure it is smooth.

(7) Hone the cylinders and ridge ream, if necessary. After honing the cylinders, visually check the honed surface of each cylinder bore. There must not be any low spot with an area larger than a half dollar. Recheck the cylinder tolerance as described above.

(8) Check the top of the block for flatness with an accurate straightedge and a feeler gauge. The top surface must not vary more than 0.005 inch (0.127 mm) on width or length. Out-of-flatness should vary gradually and uniformly from end to end and side to side. If it is necessary to machine the top surface of the block to correct for the above conditions, do not remove more than 0.005 inch (0.127 mm) of metal. The dimension from the centerline of the crankshaft to the top of the block must not be less than 13.12 inches (333.248 mm).

(9) Remove and replace any damaged or broken cylinder head studs (figure 7-63). With studs removed, inspect the tapped stud holes in the block and, if the threads are damaged, use a tap (same size as hole) to clean up the threads or retap larger and install a helical thread insert. Add Locktite, or equivalent, in hole and install new studs in the cylinder block to the dimensions indicated in table 7-3. Install the end oil passsage studs so that the oil holes are within a 40-degree angle with the center line of the rocker arm shaft, as shown in figure 7-37.

Table 7-3. Cylinder Stud Installation



Stud identification	A — Diameter		B — Height	
	Inches	Millimeters	Inches	Centimeters
A	0.562	14.2748	4.625	11.748
B	0.562	14.2748	6.655	16.904
C — Oil supply	0.625	15.8750	6.625	16.828
D — Cover	0.562	14.2748	7.435	18.885
E — Lift	0.562	14.2748	5.500	14.970

(10) Check the main bearing bores as follows:

(a) Install the main bearing caps in their original positions. Draw the bolts up snugly, and rap the bearing cap sharply with a soft hammer to assure proper seating. Tighten the bolts to the torques given in table 1-1.

NOTE

It is imperative that the main bearing caps are reinstalled in their original positions to maintain the main bearing bore alignment. The caps are marked with the number of the cylinder in which they are used.

(b) Measure the main bearing bores. The bearing bores must be 3.0665 to 3.0670 inches (77.889 to 77.902 mm). If the bores do not fall within these limits, discard the cylinder block.

(c) Check the main bearing bores for alignment. Misalignment may be caused by a broken crankshaft, excessive heat, or other severe damage. If a crankshaft having standard size journals, new standard size main bearing shells installed and lubricated, and the bearing caps properly tightened, can be rotated freely by hand, the bores are properly aligned. If a main bearing bore is out of alignment, the block must be line-bored or scraped. After boring, all bores must be within the 3.0665 to 3.0670-inch (77.889 to 77.902 mm) limits.

(11) Check the camshaft bearing bores. The internal diameter of bearing bores must be 2.1870 to 2.1889 inches (55.550 to 55.598 mm). If the bores do not fall within these limits, replace the cylinder block.

(12) Check the plugs in the vertical oil passages in the corners of the block to be sure they are flush with or below the top surface of the block.

(13) Check all of the machined accessory mounting pads for flatness, nicks, and burrs. Remove nicks and burrs with a fine file.

(14) Check the remaining studs and dowel pins in the block for damaged threads, distortion,

cracks, or other damage. Replace any damaged parts.

(15) Check all the threaded holes in the cylinder block. Make sure they are clean and the threads are in good condition. Clean up damaged threads in the tapped holes with a same-size tap or retap larger and install helical thread inserts, if necessary.

(16) Inspect the side covers (figure 7-63) and bayonet gauge tube for cracks, dents, distortion, and other damage. Replace any damaged parts.

c. *Reassembly and Installation.*

(1) Reassemble the cylinder block in reverse numerical sequence shown in figure 7-63 as follows:

CAUTION

Make certain that all open oil passage pipe plugs are installed. Be sure the lower camshaft thrust flange mounting hole is plugged with setscrew (20). This is the rear end opening of the oil passage for the rocker arms and must be plugged to prevent oil leakage.

(a) Install a new identification plate (27) onto cylinder block (28) using new screws (26).

(b) Install cylinder head studs (25 thru 21) on cylinder block (28) as shown in table 7-3.

(c) Make certain that setscrew (20, figure 7-63), expansion plugs (19), pipe plugs (18, 17), and dowel pins (16) are installed in cylinder block (28).

(d) Install oil pan adapter studs (15), gear housing stud (14), and bellhousing studs (13) into cylinder block (28).

(e) Install main bearing caps (12, 10, 9, 8) in their original positions to maintain bearing alignment. The caps are marked with the number of the cylinder in which they are used. Attach the caps to cylinder block with cap bolts (7, 11).

(f) Install two gaskets (6) and side covers (5). Attach to cylinder block (28) with lock washers (4) and cap screws (3).

(g) If removed, press oil filler tube (2) into cylinder block (28) and install the oil level gauge (1).

(2) Install the crankshaft and main bearings (para 7-26).

(3) Install pistons and connecting rod assemblies (para 7-24).

(4) Install the camshaft bearings and camshaft (para 7-22).

(5) Install gear housing, timing gears, and cover (para 7-20).

(6) Install the bellhousing and flywheel (para 7-18).

(7) Install the oil pump assembly (para 7-16) and the oil pan (para 7-15).

(8) Install the cylinder head assembly and rocker arm assembly (para 7-13 and 7-12).

(9) Install the water pump and fan assembly (para 7-10).

(10) Install the fuel injection pump (para 7-8).

(11) Install the fuel injection nozzles (para 7-6).

(12) Install the starting motor assembly (para 7-4).

(13) Install the alternator assembly (para 7-2).

(14) Install the engine in the unit (para 5-12).

APPENDIX A

REFERENCES

A-1 Fire Protection	
TB 5-4200-200-10	Hand Portable Fire Extinguishers for Army Users.
A-2 Lubrication	
C91001L	Fuels, Lubrication, Oil and Waxes.
A-3 Painting	
TM 9-213	Painting Instructions for Field Use.
A-4 Cleaning	
C68001L	Cleaning and Chemical Products.
A-5 Maintenance	
TM 5-4310-354-24P	Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools List. Compressor, Rotary, Air, Skid Mounted, Diesel Engine Driven, 125 CFM, 100 PSIG (Davey Model 6M125) NSN 4310-01-043-7604.
TM 38-750	The Army Maintenance Management System.
A-6 Shipment and Storage	
TB 740-93-2	Preservation of USAMEC Mechanical Equipment for Shipment and Storage.
TM 38-230-1	Preservation and Packing of Military Equipment.
TM 740-90-1	Administrative Storage of Equipment.
A-7 Destruction of Material to Prevent Enemy Use	
TM 750-244-3	Destruction of Material to Prevent Enemy Use.

APPENDIX B

COMPONENTS OF END ITEMS LIST

Section I. INTRODUCTION

B-1. Scope. This appendix lists Integral Components of and Basic Issue Items (BII) for the air compressor to help you inventory items required for safe and efficient operation.

B-2. General. The components of end item list are divided into the following sections:

a. Section II. Integral Components of the end item. hese items, when assembled, comprise the air comressor and must accompany it whenever it is transerred or turned in. These illustrations will help you dentify these items.

b. Section III. Basic Issue Items. These are inimum essential items required to place the air ompressor in operation, to operate it and to perform mergency repairs. Although shipped separately acked, they must accompany the air compressor uring operation and whenever it is transferred beveen accountable officers. The illustrations will asst you with hard-to-identify items. This manual is our authority to requisition replacemenb BII based n Table(s) or Organization and Equipment (TOE)/ odification Table of Organization and Equipment TOE) authorization of the end item.

3. Explanation of Columns.

a. Illustration: This column is divided as follows:

(1) Figure Number: Indicates the figure number the illustration on which the item is shown (if plicable).

(2) Item Number: The number used to identify m called out in the illustration.

b. National Stock Number (NSN): Indicates the national stock number assigned to the end item which will be used for requisitioning.

c. Part Number (P/N): Indicates the primary number used by the manufacturer which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards and inspection requirements to identify an item or range of items.

d. Description: Indicates the federal item name and, if required, a minimum description to identify the item.

e. Location: The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

f. Usable on Code: "USABLE ON" codes are included to help you identify which component items are used on the different models. Identification of the codes used in this list are:

CODE	USED ON

g. Quantity Required (Qty Reqd): This column lists the quantity of each item required for a complete major item.

h. Quantity: This column is left blank for use during inventory. Under the received column, list the quantity you actually receive on your major item. The date columns are for use when you inventory the major item at a later date, such as for shipment to another site.

Section II. INTEGRAL COMPONENTS OF END ITEM

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQ'D	(8) QUANTITY			
(a) FIGURE NO.	(b) ITEM NO.							RCV'D	DATE	DATE	DATE
			Not Applicable								

Section III. BASIC ISSUE ITEMS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8) QUANTITY			
(a) FIGURE NO.	(b) ITEM NO.	NATIONAL STOCK NUMBER	PART NO. & FSCM	DESCRIPTION	LOCATION	USABLE ON CODE	QTY REQ'D	RCV'D	DATE	DATE	DATE
		7520-00-559-9618		Cotton Duck Case			1				

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C-1. General.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions on explanatory notes for a particular maintenance function.

C-2. Maintenance Functions.

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), and item, or system.

j. Overhaul. That maintenance effort (services/actions) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipments/components.

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C-3. Column Entries Used in the MAC.

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph C-2.)

d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform the maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work time figures will be shown for each level. The number of man-hours specified by the work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance levels are as follows:

C	Operator or crew
O	Organization maintenance
F	Direct support maintenance
H	General support maintenan
D	Depot maintenance

e. Column 5, Tools and Equipment. Column specifies, by code, those common tool sets (r individual tools) and special tools, test, and suppo equipment required to perform the designat function.

f. Column 6, Remarks. This column shall contai letter code in alphabetical order which shall be key to the remarks contained in Section IV.

C-4. Column Entries Used in Tool and Test Equi ment Requirements.

a. Column 1, Tool or Test Equipment Referen Code. The tool and test equipment reference co correlates with a maintenance function on the ide tified end item or component.

b. Column 2, Maintenance Level. The lowest lev of maintenance authorized to use the tool or te equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National/NATO Stock Number. Th National or NATO stock number of the tool or tes equipment.

e. Column 5, Tool Number. The manufacturer' part number.

C-5. Explanation of Columns in Section IV.

a. Reference Code. The code scheme recorded in column 6, Section II.

b. Remarks. This column lists information pertinent to the maintenance function being performed as indicated on the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
01	Air Cleaner	Inspect	0.1						A-A
		Service	0.1						
		Replace	0.2						
02	Exhaust Muffler	Inspect	0.1						A-A
		Replace		0.5					C-B
03	Battery Box	Inspect	0.1						
		Service	0.5						
		Repair		0.5					
		Replace		1.0					
04	Hose & Hose Reel	Inspect	0.1						A-A
		Test	0.1						
		Repair		1.0					
		Replace		0.3					
05	Compressor Enclosure Roof	Inspect	0.1						
		Service		0.5				3-I	A-A
		Repair		1.0					G-I
		Replace		1.0					
	Door Assy & Latches	Inspect	0.1						A-A
		Service		0.5					
		Replace		1.0					
		Repair		0.5					
	Receptacle, Charging	Test		0.1				2-B	A-A
		Replace		0.5					I-B
	End Panel	Inspect	0.1						A-A
		Service		0.5					
		Replace		1.0					
		Repair		1.0				3-I	
	End Cover	Inspect	0.1						
		Service		0.5					
		Replace		1.0					
		Repair		1.0				3-I	
	Guard	Inspect	0.1						A-A
		Service		0.5				3-I	G-I
		Replace		1.0					
		Repair		1.0					
	Shroud	Inspect	0.1					3-I	A-A
		Service		0.5					G-1
		Replace		1.0					
		Repair		1.0					
06	Radiator, Hoses, Drain and Cap	Inspect	0.1						A-A
		Test	0.2						C-B
		Replace	0.1						
	Hoses, Water	Inspect	0.1						A-A
		Replace		0.5					C-B

Section II. MAINTENANCE ALLOCATION CHART — Continued

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
06(cont)	Drain Lines and Valves	Inspect	0.1						A-A
		Service	0.5						
		Replace		0.3					
	Radiator	Inspect	0.1					28A	A-A
		Test	0.1						C-B
		Service	0.5						Q-C
		Replace		2.0					
		Repair				3.0			
07	Fuel Lines, Hoses and Fittings	Inspect	0.1						
		Replace		0.2					C-B
		Repair		0.3					
08	Air Lines, Hoses & Fittings	Inspect	0.1						A-A
		Replace		0.2					C-B
		Repair			0.5				
09	Fuel Filter, Engine	Inspect	0.1						A-A
		Service		0.3					
		Replace		0.5					
10	Alternator Assy Group	Inspect	0.1					2-B	A-A
		Test		1.0				9-A	C-B
		Adjust		0.3					L-B
		Replace		0.5					K-A
		Repair			1.5				D-I
	Belt	Inspect	0.1					8-A	A-A
		Adjust		0.4					R-D
		Replace		0.4					
	Diodes	Inspect			0.2			2-B	FB
		Test			0.1			6-I	
		Replace			0.5				
	Rotor	Inspect			0.2			2-B	FB
		Test			0.5				
		Replace			1.0				
	Brush Assembly	Inspect			0.1			2-B	VA
		Test			0.1				
		Replace			0.5				
	Voltage Regulator	Inspect			0.2			2-B	C-B
		Test			0.2			9-A	
		Replace			0.4				
	Stator Assembly	Inspect			0.2			2-B	
		Test			0.3				
		Replace			1.0				
	Bearings	Inspect			1.0				KA
		Replace			1.0				
11	Starter Assembly, Engine	Inspect	0.1					2-B	C-B
		Test		0.3				11-A	D-I
		Replace		1.0					
		Repair			1.5				
		Overhaul				2.5			

Section II. MAINTENANCE ALLOCATION CHART — Continued

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
11 (cont)	Brushes	Inspect			0.2				V-A
		Replace			1.5				
	Plunger Assembly, Solenoid	Test		0.1				2-B	
		Replace			0.9				
		Repair			1.0				
	Armature	Test			0.5			13-A	A-A
		Replace			1.0				W-B
		Repair			1.0				
	Drive	Inspect			0.1				
		Adjust			0.3				
		Replace			0.8				
		Repair			0.5				
	Field Assembly	Inspect			0.1				L-B
		Test			0.2				W-B
		Replace			1.0				
		Repair			1.0				
	Holder, Brush	Inspect			0.1			2-B	AA
		Test			0.2				
		Replace			0.2				
	Bearing	Inspect			0.2				KA
		Replace			1.0				
12	Oil Cooler, Hoses, and Fittings								
	Switch, Safety	Inspect	0.2					2-B	
		Test		0.8					
		Replace		0.5					
	Hose Assemblies	Inspect	0.1						A-A
		Replace		0.3					
		Repair		0.5					
	Fittings	Inspect	0.1						A-A
		Replace		0.4					
		Repair		0.4					
	Oil Cooler (Compressor)	Inspect		0.1					A-A
		Replace		0.1					
		Repair				2.0			
13	Switch Assembly, Speed	Test			0.1			2-B	U-D
		Adjust			0.2				Reset
		Replace		0.2					
		Repair		0.5					
14	Engine Assy	Inspect	0.1					4-H	A-A
		Test		1.0				5-H	Q-C
		Service	0.8					10-B	C-B
		Replace			16.0			12-A	
		Repair			12.0				
		Overhaul				80.0			

Section II. MAINTENANCE ALLOCATION CHART — Continued

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
14 (cont)	Nozzles, Fuel Injection	Inspect		0.1				14-A	A-A
		Test			0.5				YD
		Adjust			0.2				
		Replace		0.4					
		Repair			1.0				
		Overhaul				2.0			
	Pump, Fuel Transfer	Inspect	0.1						A-A
		Test		0.2					
		Replace		0.4					D-I
		Repair			1.0				
		Overhaul			1.0				AC-B
	Pump, Fuel Injection	Inspect	0.1						A-A
		Test			0.5			14-A	J-B, D, & I
		Adjust			0.2				
		Replace			1.0				P-D
		Repair			1.5				C-B
		Overhaul				6.0			
	Fan, Cooling	Inspect	0.1						A-A
		Replace		0.6					
		Repair		0.7					
	Pump Assembly, Water	Inspect	0.1						A-A
		Replace		1.0					D-I
		Repair			1.5				
	Thermostat and Housing	Test		0.1				7-B	O-B
		Replace		0.8					
	Drive Adaptor, Over-Speed	Inspect		0.1				2-B	
		Test		0.8					
		Replace		0.1					
	Switch, Temperature, Engine Water	Inspect		0.1				2-B	F-B
		Test		0.2					
		Replace		0.3					
	Manifold, Exhaust	Inspect		0.1					A-A
		Replace		0.9					
	Manifold, Intake	Inspect		0.1					A-A
		Replace		0.9					
	Breather, Valve Cover	Inspect	0.1						A-A
		Service	0.2						
		Replace		0.1					
	Rocker Arm Assy	Inspect		0.1				16-A	
		Service		0.1				12-A	
		Replace			2.0				
		Repair			1.0				
	Rocker Arm	Inspect		0.1					R-D
		Adjust		0.2					
		Replace			0.2				

Section II. MAINTENANCE ALLOCATION CHART — *Continued*

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
14 (cont)	Pushrod	Inspect			0.1			12-A	
		Replace			2.0				
	Cylinder Head Assembly	Inspect			0.1			15-A	Z-I
		Replace			5.0			16-A	
		Repair			2.0			J-B	
		Overhaul				4.0			
	Valve, Intake & Exhaust	Inspect			0.1			17-A	C-B
		Replace			3.0				
		Repair			1.5				
	Spring, Valve	Test			0.2			11-A	AA-B
		Replace			1.5			18-A	
	Guide, Valve	Inspect			0.1			19-A	
		Replace			4.0				
	Oil Pan Assy	Inspect	0.1						A-A
		Replace			1.0				
		Repair			1.0				
	Seal, Oil Pan	Replace			1.0				A-A
	Oil Pump	Test				1.0			
		Replace				3.0			
		Repair				2.0			
	Flywheel Assy	Inspect			0.1				AE-H
		Replace			1.0				
	Ring Gear	Inspect				0.1			AD-H
		Replace				2.0			
	Housing	Inspect				0.1			AF-H
		Replace				2.0			
	Cover, Timing	Inspect			0.1				AG-H
		Replace				2.0			
	Gears, Timing	Inspect				0.1			A-HH
		Replace				4.0			
	Connecting Rod	Inspect				0.1		21-A	AI-H
		Replace				10.0		20-B	
	Rod, Bearings	Inspect				0.1		20-A	
		Replace				2.0			
	Piston	Inspect				0.2		25-A	
		Replace				10.0			
	Piston, Pin	Inspect				0.1		20-A	
		Replace				6.0			
	Piston Rings	Inspect				0.1		24-A	
		Replace				2.0			

Section II. MAINTENANCE ALLOCATION CHART — Continued

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	 O	 F	 H	 D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
14 (cont)	Crankshaft	Inspect				0.2		27A	
		Replace				6.0			
	Main Bearing	Inspect				0.2		16A 20A 22-A 26-A	
		Replace				6.0			
	Bearing, Camshaft	Inspect				0.2		20-A	
		Replace				7.0		22-A	
	Cylinder Block	Inspect				0.2			
		Replace				30.0			
		Repair				2.0			
		Overhaul				4.0			
	Dipstick, Oil Level	Replace	0.1						A-A
		Inspect	0.1						
	Oil Filter, Engine	Inspect	0.1						X-C
		Replace	0.2						
15	Pneumatic Equip								
	Air Compressor Assy	Inspect	0.1						A-A
		Test		0.5					S-B
		Adjust		1.0					AC-B
		Service	0.8						
		Replace			6.0				
		Repair			8.0				
		Overhaul				10.0			
	Gasket & Seal, Kit, Compressor	Replace				4.0			
	Compressor Drive Coupling	Replace			7.0				
	Adapter Engine	Replace			7.0				
	Rotor Assy	Replace				8.0			
		Repair				8.0			
	Stator Assy	Replace				8.0			
		Repair				8.0			
	Bearings	Replace				8.0			K-A
	Blades, Rotor	Inspect			2.0				A-A
		Replace			2.0				
	Intake Control, Air/Speed Control	Inspect			2.0				A-A
		Test			2.0				
		Service			2.0				
		Replace			2.0				
		Repair			4.0				
		Overhaul			5.0				

Section II. MAINTENANCE ALLOCATION CHART — Continued

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
15 (cont)	Oil Filter & Thermal Bypass Assembly, Compressor	Inspect	0.1						A-A
		Service	0.8						
		Replace		0.5					
		Repair	1.0						
	Element, Oil Filter	Inspect	0.4						Clean
		Service	0.4						
		Replace	0.5						
	Oil Separator Assy	Inspect	0.1						A-A
		Service	1.0						
		Replace			3.0				
		Repair			4.0				
		Overhaul				5.0			
	Valve, Relief, Safety	Test			0.1				
		Replace			0.3				
	Valve, Throttle, Air Service	Test			0.1				
		Replace			0.3				
	Valve Assy Minimum Pressure	Test			0.1				
		Replace			0.3				
	Element	Inspect			0.5				A-A
		Service			0.5				
		Replace			0.5				
16	Instrument Panel Assy	Inspect	0.1					2-B	A-A
		Service	0.1						
		Replace			2.0				
		Repair			2.0				
		Overhaul			3.0				
	Instrument Panel	Inspect	0.1					2-B	A-A
		Replace			1.5				
	Fuel Level Gauge	Inspect	0.1					2-B	F-B
		Test		0.3					
		Replace		0.5					
	Push Button Switches	Inspect	0.1					2-B	F-B
		Test		0.3					
		Replace		0.5					
	Pressure Switches	Inspect	0.1					2-B	F-B
		Test		0.3					
		Replace		0.5					
	Oil Temp Gauge	Inspect	0.1					2-B	
		Test		0.3					
		Replace		0.5					
	Air Pressure Gauge	Inspect	0.1						
		Test		0.3					
		Replace		0.5					

Section II. MAINTENANCE ALLOCATION CHART — *Continued*

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
16 (cont)	Water Temp Gauge	Inspect	0.1					7-B	
		Test		0.3					
		Replace		0.5					
	Switch, Panel Light	Inspect	0.1					2-B	F-B
		Test		0.3					
		Replace		0.5					
	Control Assy	Adjust		0.1					
		Replace		0.5					
	Lamp, Panel	Inspect	0.1					2-B	F-B
		Test	0.1						
		Replace	0.1						
	Tachometer/Hr Meter	Inspect	0.1						E-D
		Test	0.1						
		Replace		1.0					
	Cable	Inspect	0.1						
		Service		0.3					
		Replace		0.5					
	Panel & Fittings	Test		0.5					
		Replace		0.5					
	Air Cleaner Restriction Indicator	Inspect	0.1						
		Replace		0.5					
	Ignition Switch	Inspect	0.1					2-B	F-B
		Test		0.3					
		Replace		0.5					
	Ammeter	Inspect	0.1						
		Test		0.3					
		Replace		0.5					
	Vibration Mount	Inspect	0.1						
		Replace		0.5					
	Gauge, Fuel Pressure	Inspect	0.1						
		Test		0.3					
		Replace		0.5					
	Wire Assemblies	Inspect	0.1						HK
		Test		0.3					
		Replace		0.5					
		Repair		0.5					
	Gauge, Oil Pressure	Inspect	0.1						
		Test		0.3					
		Replace		0.5					
	Cables, Control, Idle and Unloader	Adjust		0.3					
		Test		0.3					
		Replace		0.5					

Section II. MAINTENANCE ALLOCATION CHART — Continued

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
16 (cont)	Quick Start Assy	Service	0.1						
		Test		0.1					
		Replace		0.5					
17	Speed Control Group								
	Rod, Speed Control	Adjust		0.1					CB
		Replace		0.3					
	Blowdown Valve Assy	Test			0.3				
		Replace			0.5				
		Repair			0.5				
	Sight, Flow	Inspect	0.1						A-A
		Replace			0.5				
	Pressure Regulator Assy	Test			0.5				
		Adjust			0.5				
		Replace			0.6				
		Repair			1.0				
18	Fuel Tank Assy	Inspect	0.1						A-A
		Service	0.1						N-C
		Replace			1.0				
		Repair			1.5				
	Filler Cap	Inspect		0.1					
		Replace		0.1					
	Neck	Inspect		0.1					
		Replace		0.5					
		Repair			0.5				
	Hose & Lines	Inspect		0.1					A-A
		Replace		0.2					
	Strap, Assy	Inspect		0.3					
		Replace		0.5					
		Repair		0.3					
	Fuel Gauge Sending Unit	Inspect		0.1					
		Test		0.2					
		Replace		0.5					
19	Batteries	Inspect	0.1						A-A
		Test		0.2				1-B	B-B
		Service	0.1						
		Install		0.5					
		Replace		0.5					
	Cables, Btry	Inspect	0.1					2-B	A-A
		Replace		0.3					
		Repair		0.5					
20	Skid and Frame	Inspect	0.1						
		Repair			2.0			3-I	
	Vibration mount, Engine	Inspect			0.1				A-A
		Replace			1.0				

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

(1) REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL/NATO STOCK NUMBER	(5) TOOL NUMBER
1-B	0	Tester, Battery, Electrolyte Solution (Component of Tool Set, L/I T13152)		6630-171-5126 or Equal.
2-B	0	Multimeter		6625-581-2036 or Equal.
3-I	0	Torch Outfit, Cutting & Welding (Tool Set, L/I W67706)		3433-357-6311 or Equal.
4-H	F	Hoist, Chain, 3 Ton		3950-292-9879 or Equal.
5-H	F	Trestle, Hoist, Portable, 5 Ton		3950-449-7005 or Equal.
6-I	0	Soldering Outfit, Electric		3439-853-8760 or Equal.
7-B	0	Thermometer, Self-Indicating, 50-400 Degree F. Range		6685-527-7867 or Equal.
8-A	0	Scale, Dial Indicating, 0-50 lb.		6670-254-4634 or Equal.
9-A	0	Test Set, Generator and Voltage Regulator		4910-270-3780 or Equal.
10-B	F	Tachometer, Stroboscopic		6680-892-1510 or Equal.
11-A	0	Tester Spring Resiliency		6635-449-3750 or Equal.
12-A	F	Gage, Thickness		5120-221-1999 or Equal.
13-A	F	Test Set, Armature		6625-238-1459 or Equal.
14-A	F	Tool Kit, Diesel Injector Repair		4910-317-8265 or Equal.
15-A	F	Grinding Kit, Valve Seat		4910-473-6437 or Equal.
16-A	F	Wrench, Torque		5120-542-5577 or Equal.
17-A	F	Grinding Machine, Valve Face		4910-540-4679 or Equal.
18-A	F	Lifter, Valve Spring		5120-239-8686 or Equal.
19-A	H	Remover and Replacer, Valve Guide		5120-219-8404
20-A	H	Caliper Micrometer, Outside, 1" thru 2"		5210-243-2933 or Equal.
20-B	H	Indicator, Connecting Rod Alignment		4910-733-2487 or Equal.
21-A	H	Wrench, Torque		5120-640-6364 or Equal.
22-A	H	Gage Set, Telescoping		5120-473-9350 or Equal
23-A	H	Gage, Thickness		5120-517-8097 or Equal.
24-A	H	Compressor, Piston Ring		5120-894-0793 or Equal.
25-A	H	Expander, Piston Ring		5120-393-0549 or Equal.
26-A	H	Caliper, Micrometer		5120-255-7564 or Equal.
27-A	H	Caliper, Micrometer		5210-221-1934 or Equal.
28-A	C	Hydrometer (Antifreeze)		

Section IV. REFERENCE CODES-REMARKS

REFERENCE CODE	REMARKS
A-A	Visual Inspection
B-B	Hydrometer Test
C-B	Operational Test
D-I	Repair by Replacement of Components
E-D	Zero Adjust
F-B	Continuity Test
G-I	Weld and Straighten
H-K	Fabricate New Harness
I-B	Test for Known Voltage at Terminals
J-B, D, & I	In Accordance with Procedures in Applicable TM
K-A	Visual, Audible and Physical Heat Detection
L-B	Insulation Breakdown and Continuity Tests
N-C	Drain Condensation
O-B	Thermometer Test
P-D	Adjust After Replacement or Repair
Q-C	Check Fluid Level
R-D	Adjust to Specifications in Applicable TM
S-B	Test Pressure Output
T-D	Adjust Pressure Output
U-D	Overspeed Only
V-A	Inspect for Minimum Length
W-B	Growler Test
X-C	Replace Element
Y-D	Adjust Injector Pressure Setting
Z-I	Includes Replacing Valves and Springs
AA-B	Spring Tension and Length
AC-B	Pressure Test
AD-H	Engine Out of Unit and Flywheel Removed
AE-H	Engine Out of Unit
AF-H	Engine Out of Unit — Includes Removal and Installation of Flywheel.
AG-H	Engine Out of Unit
AH-H	Engine Out of Unit — Timing Gear Cover Off.
AI-H	Engine Out of Unit — Includes Removal of Head and Pan Assemblies.

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

D-1. Scope. This appendix lists additional items you are authorized for the support of the air compressor.

D-2. General. This list identifies items that do not have to accompany the air compressor and that do not have to be turned in with it. These items are authorized to you by CTA, MTOE, TDA or JTA.

D-3. Explanation of Listing. National stock number, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. "USABLE ON" codes are identified as follows:

CODE USED ON

Section II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION		(3)	(4)
	PART NUMBER & FSCM	USABLE ON CODE	U/M	QTY AUTH.
4210-00-555-8837	Extinguisher, Fire			1
4240-00-022-2946	Protector, Aural			1

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6	2-1 a			In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders.
81		4-3		Callout 16 on figure 4-3 is pointing at a bolt. In the key to fig. 4-3, item 16 is called a shim. Please correct one or the other.
125	line 20			I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered so the NSN is wrong. Please give me a good NSN.

SAMPLE

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = . 39 inch
1 decimenter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = . 15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigrams = . 035 ounce
1 dekagram = 10 grams = . 35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = . 34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.82 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = . 155 sq. inch
1 sq. decimenter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = . 386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = . 06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.365	metric tons	short tons	1.102
pound-inches	newton-meters	.11375			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN : 045182-000